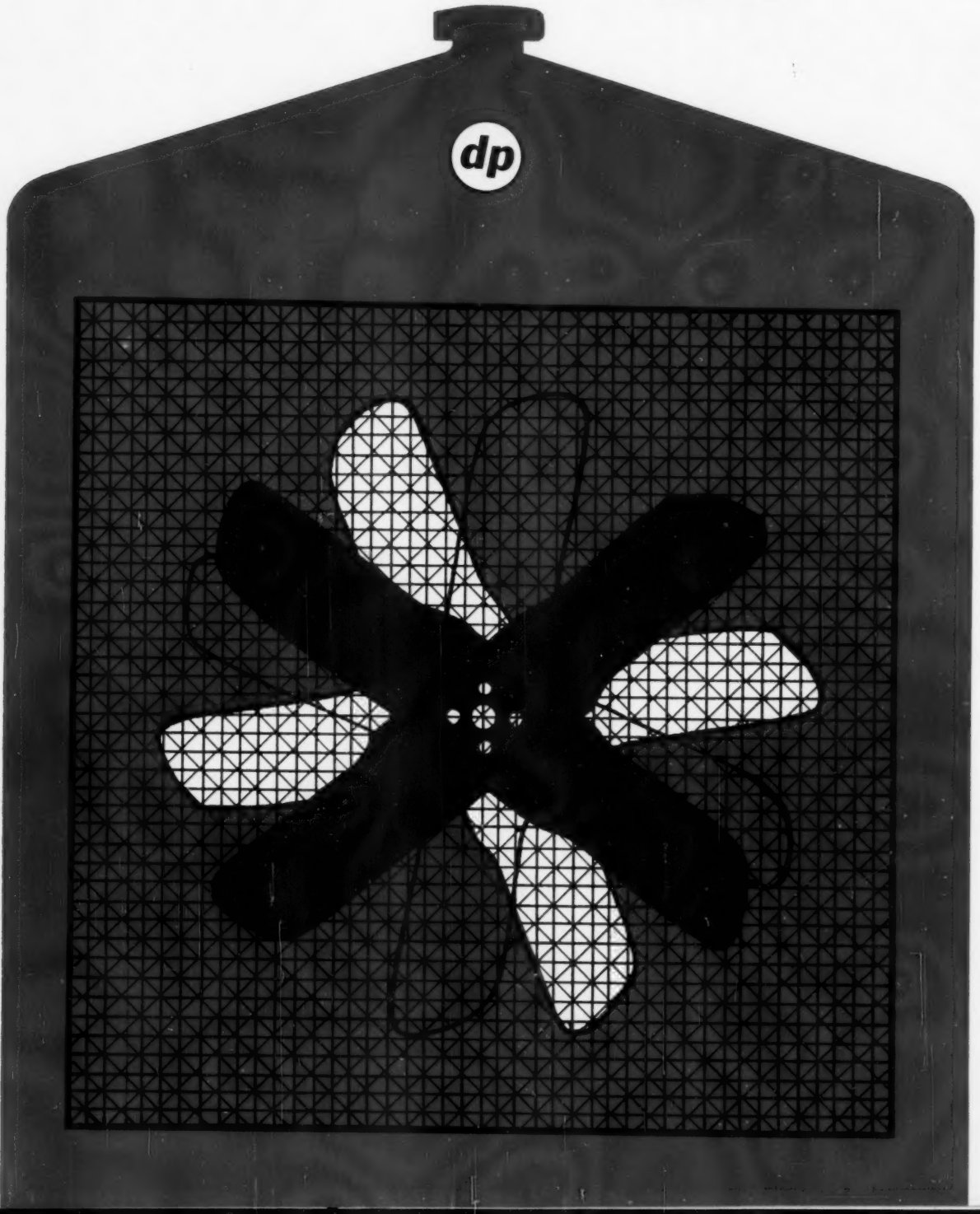
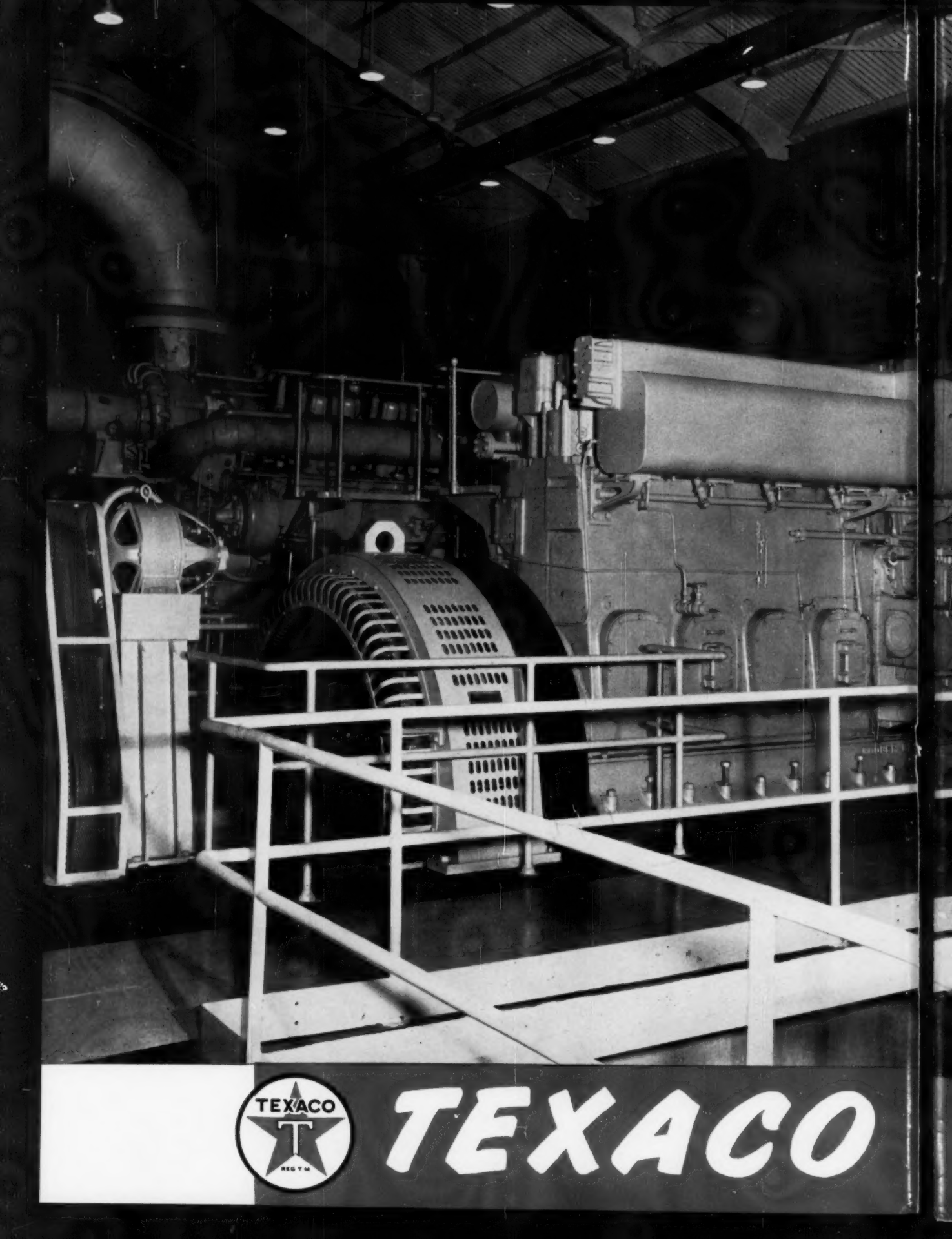
diesel power

August 1957




TEXACO
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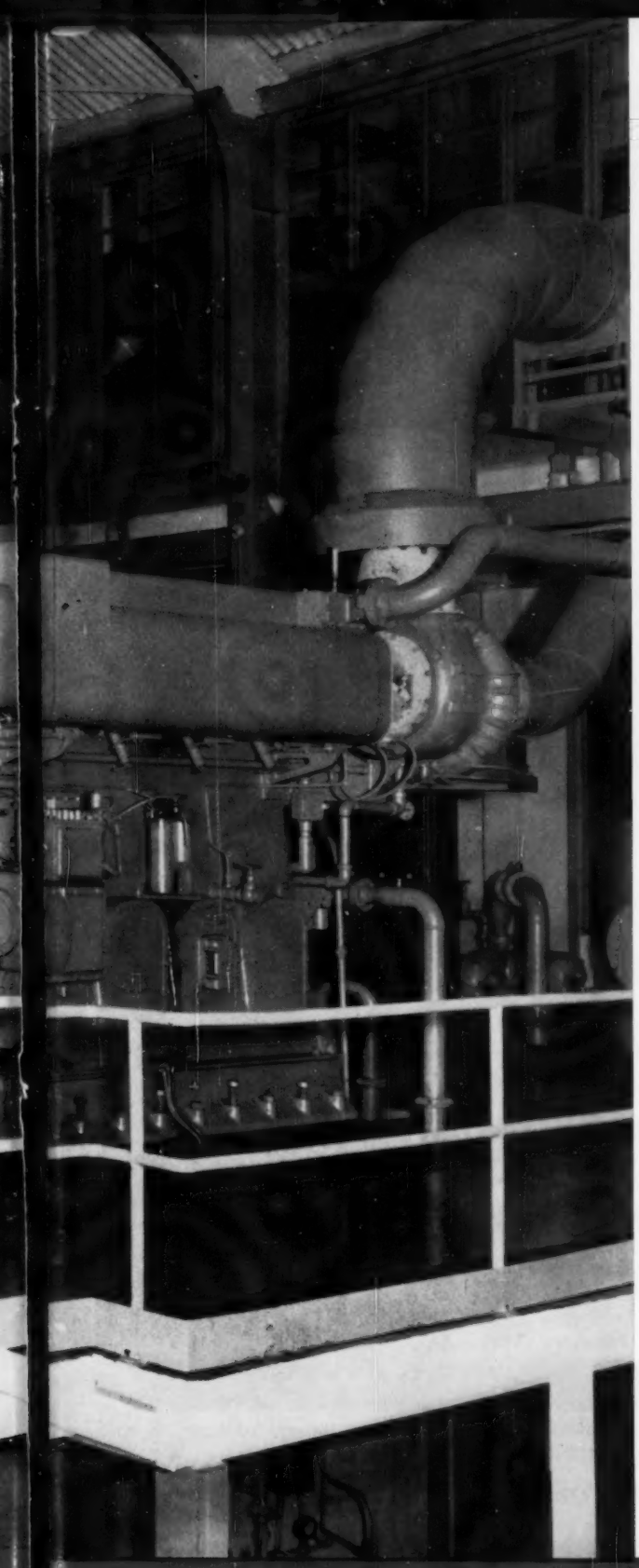


POWER PLANT OPERATORS REPORT:

MORE POWER from TEXACO LUBRICATED ENGINES

According to actual case history reports, power plant engines show a power performance improvement when lubricated with *Texaco Ursa Oils*. This is because *Texaco Ursa Oils* 1) help keep rings free for full-power compression and complete combustion, 2) resist oxidation and sludging, 3) prevent harmful deposits, 4) reduce wear.

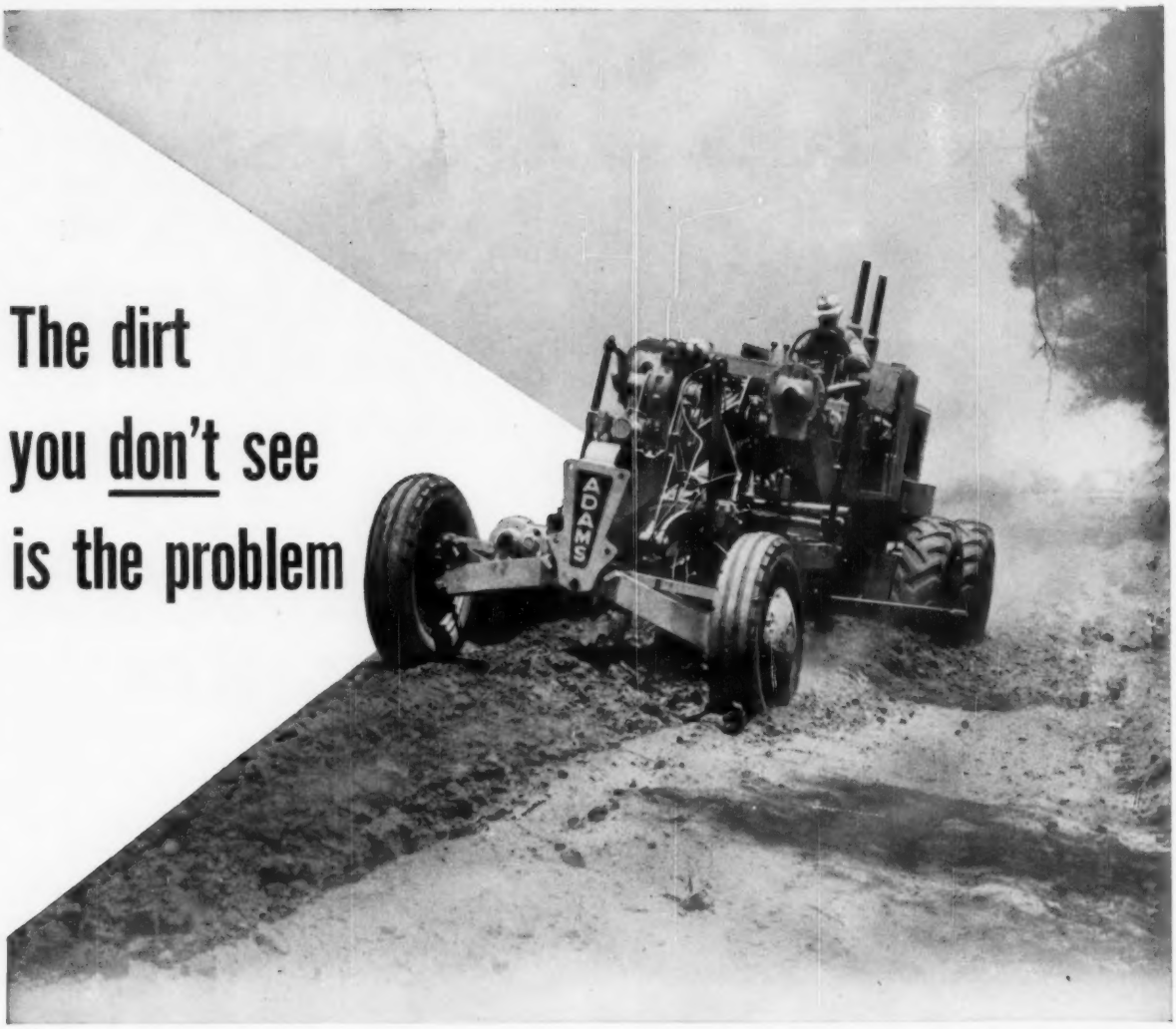
There is a complete line of *Texaco Ursa Oils*, designed and processed especially to make diesel, gas, and dual-fuel engines deliver *more power* with *less fuel* and *longer periods* between overhauls.

For over 20 years, more stationary diesel horsepower in the U. S. has been lubricated with Texaco than with any other brand.

Your Texaco Lubrication Engineer will give you full information. Just call the nearest of more than 2,000 Texaco Distributing Plants in the 48 States or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

The dirt you don't see is the problem



Le-Tourneau-Westinghouse Adams "660" Grader, powered by 150 H. P. Diesel Engine

Dry Type Micronic® Air Filtration solves it

The tons of dirt this grader moves in a day don't give it any trouble at all. But just let a little of the dirt that's drawn in with the air intake get through to the engine and it'll stop dead in its tracks. That's why efficient air filtration is so vital to the operation of this equipment . . . why engine and equipment manufacturers have accepted PurOlator's new Dry Type Micronic® Air Filter as the most efficient yet developed.

Whether your engine is idling or revving at top speed, this new Purolator Air Filter removes 99% of all contaminants. That makes it virtually impossible for harmful abrasives to get into the precision parts of the engine no matter how dirty the job or where you're working. The Dry Type Micronic elements save time and effort in servicing, too. Elements can be replaced in one-tenth the time — and with one-tenth the effort — needed to service other types.

Purolator Catalog AFC-56 contains a valuable chapter "Facts about engine air requirements" that can help you prolong engine life and reduce repair bills. Send for your free copy today. Address Dept. DP9-911.

Filtration For Every Known Fluid

PUROLATOR

PRODUCTS, INC.

Rahway, New Jersey and Toronto, Ontario, Canada

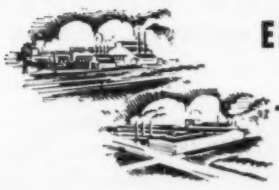
from the "Hub" of AMERICAN INDUSTRY

Steel Forgings—Steel Castings . . .

Unbiased design recommendations are yours for the asking

Unbiased design recommendations for the use of steel forgings, steel castings or both result from 85 years experience in their production at Erie Forge & Steel Corporation.

Not only do you have the advantage of this unusual dual production at the geographic hub of America's busiest industrial region . . . you also draw upon our design and engineering experience in specifying steel forgings, castings or combined assemblies for a wide diversity of industrial, maritime, and transportation equipment. Here your steel forgings and castings are produced from raw materials to finished product "Under One Responsibility and One Control." You will profit by consulting with us.



ERIE FORGE & STEEL CORPORATION

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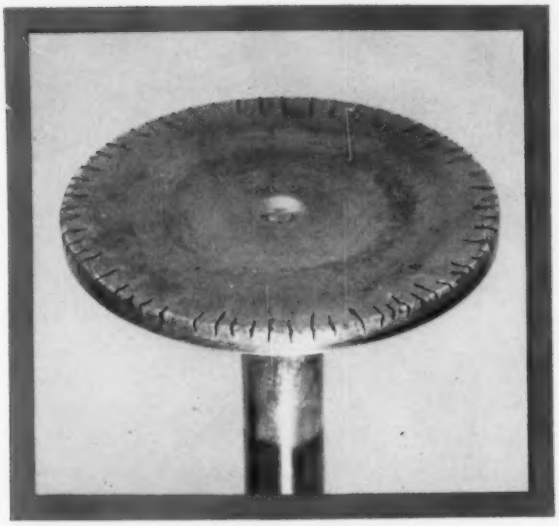
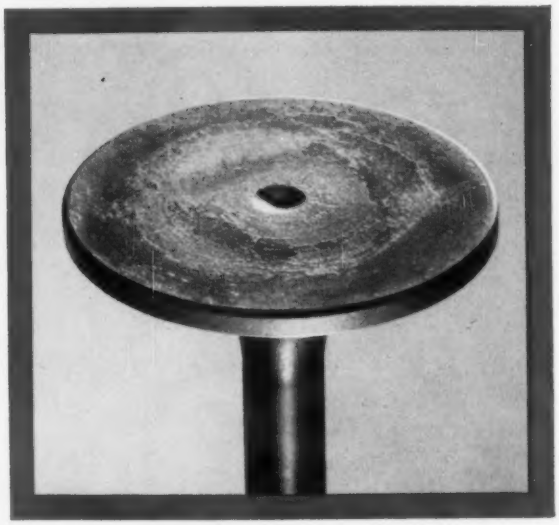
Accelerated Engine Test Comparison Proves

EATON SUPER-ALLOY VALVES LAST MANY TIMES AS LONG

AS VALVES MADE FROM COMMONLY USED ALLOYS



COMMONLY USED ALLOY
Failed at Less than
600 Hours

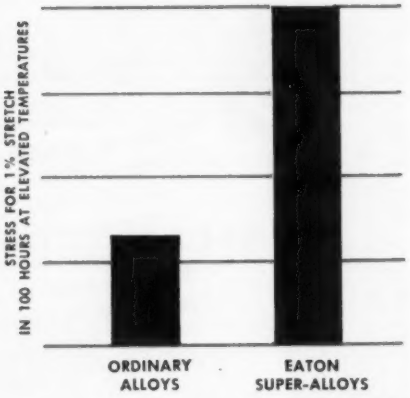


EATON SUPER-ALLOY
in Excellent Condition
after 3000 Hours

To meet the requirements of extreme heavy duty service, Eaton has developed unique production methods for the making of exhaust valves of super-alloys possessing exceptionally high hot-strength and corrosion resistant properties. These Eaton Super-Alloy Valves are "custom tailored" to meet the specific requirements of the engines for which they are designed.

As a pioneer in the development of valve designs and materials which have added thousands of miles to valve life expectancy, Eaton has made such important contributions as sodium cooled valves, seat-faces of high-alloy materials, aluminized valves, and now super-alloy valves.

If you build engines—either gasoline or diesel—for heavy duty applications such as motor trucks, buses, earth moving machinery —it will pay you to discuss the advantages of Eaton Super-Alloy Valves with our engineers.



The results of laboratory tests represented by the above graph indicate the superior hot-strength of Eaton Super-Alloys over commonly used exhaust valve materials.

EATON

VALVE DIVISION
MANUFACTURING COMPANY
9771 FRENCH ROAD • DETROIT 13, MICHIGAN

PRODUCTS: Engine Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Hydraulic Pumps Motor Truck Axles • Permanent Mold Gray Iron Castings • Forgings • Heater-Defroster Units • Automotive Air Conditioning Fastening Devices • Cold Drawn Steel • Stampings • Gears • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

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diesel power

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Editorial

A Question of Ethics (?) 27

Articles

Service Your Turbo—Keep It Trouble Free 30
Talking Shops 34
Lake RR Bed Construction Depends on Diesels 37
Save Fuel Costs For Earthmover Engines 38
Reconditioning Crankshafts 40
Internal Combustion Leaks Located From Outside 43
Residual Fuel Pays Off For Municipal Plant 44
Gas Turbines Burn Coal Too 47
Governor Test Stand a Must For Accuracy 49
What Readers Write 50

Departments

Highlights 29
Service Section 51
News of Our Industry 52
New Products 56
Organizational News 60
New Literature 64

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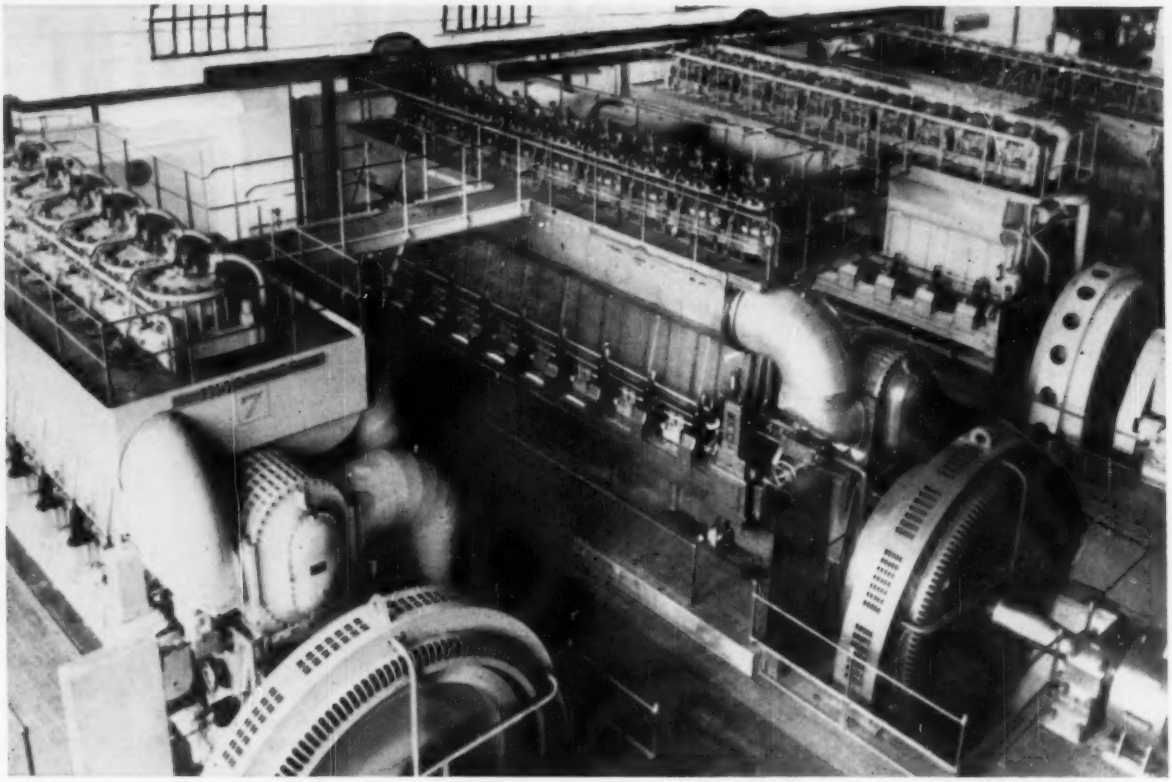
Look to COOK for Better Rings!



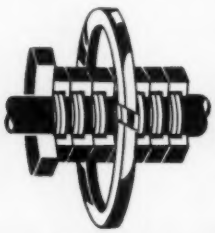
After 25,037 operating hours... Cook rings good for 10,000 more!

HERE'S the result of a cylinder inspection by Rockville Centre, N. Y., municipal power plant officials. It's a report on their No. 8 Diesel unit after almost three years of continuous operation.

"While several rings were replaced in Grooves 1 and 2, Cook rings in Grooves 3, 4, 5 and 6 could run for another 10,000 hours! And cylinders averaged less than .001" maximum wear per 1000 hours of operation."

Light-tight Cook Piston Rings prevent scuffing and blow-by . . . conform perfectly to the cylinder wall because they are re-turned as a final manufacturing process. In addition, Cook rings are tensioned by an exclusive, gentle "squeezing" process that guarantees constant, uniform tension — *for life!*

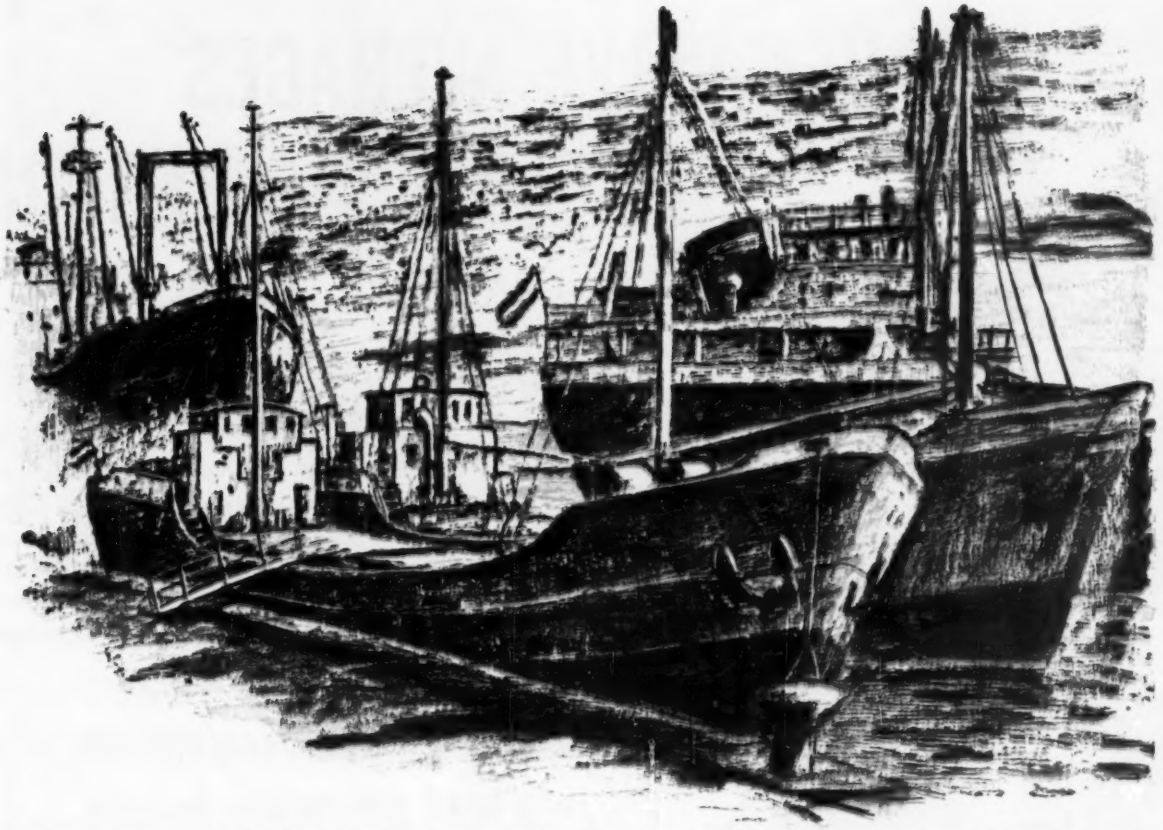
For complete information on Cook Piston Rings and name of nearest representative, write: C. Lee Cook Company, 946 South 8th Street, Louisville 3, Kentucky.



C. LEE COOK COMPANY

A Division of Dover Corporation

Rings and Packings Since 1888

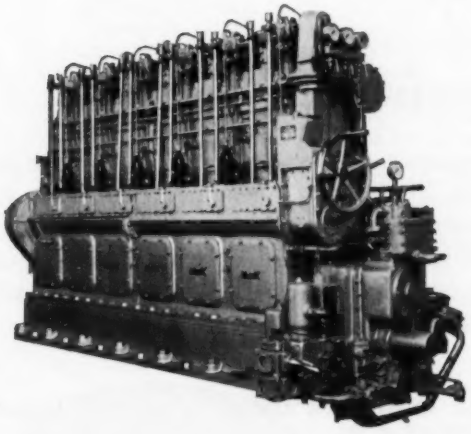


DIRECTLY ON THE BUSIEST NAVIGABLE WATERWAYS OF THE BALTIC SEA

next to the floodgates of the North Sea-Baltic Canal there are situated the wharfs of *MaK*.

Experts of the *MaK* service workshops are testing here marine engines for capacity and economy.

Apart from the well-known advantages of the MaK Diesel engines it is the unique *MaK* service which is always ready for use and therefore is fully appreciated everywhere in navigation circles.



Some technical data of the series M423 type engine which stands the test extraordinarily as main engine and servo-motor:

4, 6 and 8 cylinders—bore and stroke 290 / 420 mm cylinder output without supercharging 75 HP at 428 r.p.m.

6 and 8 cylinder engine also with supercharging up to 50% increase of the cylinder output up to approximately 112 HP range of capacity from 185 up to appr. 900 HP at 265 to 428 r.p.m.

MaK-engines approved on all waterways and railways.

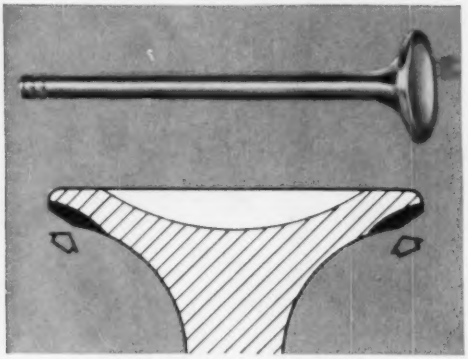
MaK

MASCHINENBAU KIEL AKTIENGESELLSCHAFT

GERMANY

Electro-Motive Parts Progress

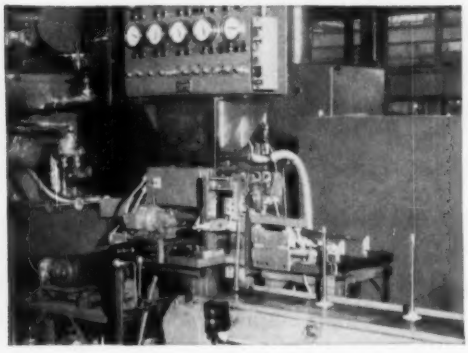
THIS EXHAUST VALVE AVERAGES TWO YEARS SERVICE BEFORE REGRIND



Reasons:

1 *Engine's choice*

Experience has taught us that an engine dictates its own valve needs. Our Model 567 Diesel proved this when previous valve designs of other engines were tried. Exhaustive testing produced the valve shown here, which in normal passenger or freight service runs two years before seat and face regrind. Cutaway view shows special hard Stellite face on valves dictated by our higher horsepower 567C Diesel.



2 *Exclusive manufacture and inspection process*

Manufactured almost entirely by automatic machines, Electro-Motive valves are held to extremely close tolerances. Guarding this precision is a battery of automatic and visual "in-process" inspection controls that assure constant quality and absolute machining accuracy. An example is this electronic machine which checks 14 tolerances at one time on every valve.

3 *Protective packaging*

This special package is used to protect the finely machined surfaces of the valve during handling. Each valve is fitted snugly and protected against moisture with rust preventative V.P.I. paper. Packing like this keeps the valves in perfect condition, always ready for immediate use, and far easier to handle and store.

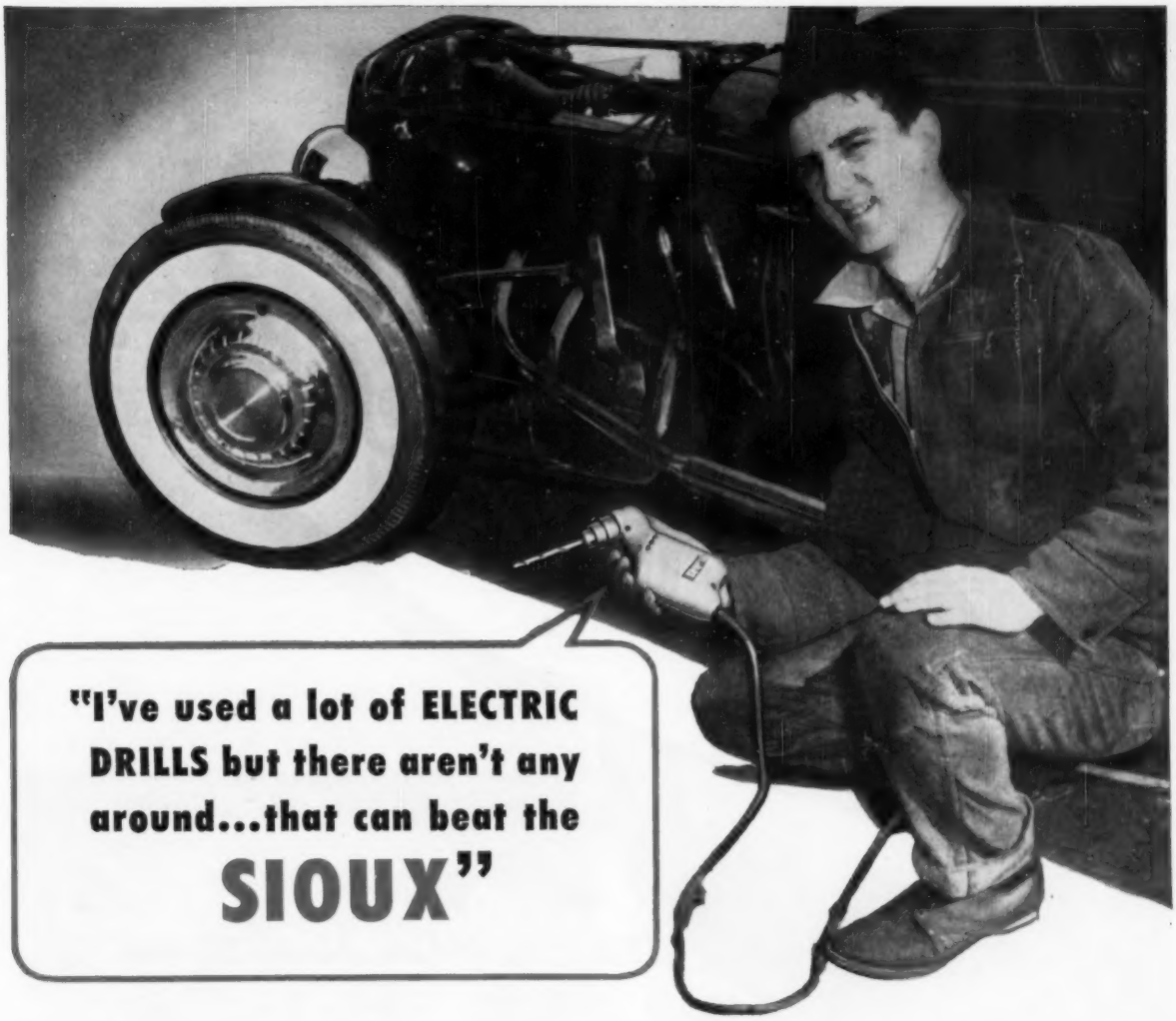
Continuing improvement is an unending program at Electro-Motive to bring you products of highest quality at lowest cost. When you buy General Motors Diesel parts you get components that are designed, engineered and built to work together. In addition, you benefit with a full warranty and convenient, fast delivery from nine strategically located Electro-Motive warehouses.

GENERAL MOTORS LOCOMOTIVES

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

LA GRANGE, ILLINOIS • *HOME OF THE DIESEL LOCOMOTIVE*

In Canada: General Motors Diesel, Ltd., London, Ontario



"I've used a lot of ELECTRIC DRILLS but there aren't any around...that can beat the SIOUX"

"I've been meaning to write this letter to you people for a very long time. In 1952 I bought a 6" Ball Bearing Bench Grinder, a Half Inch Heavy Duty Drill and also a No. 1495 ¼" ALL-ANGLE Drill. In all that time I haven't had a bit of trouble with any of these tools.

All three tools are great, but the ¼" ALL-ANGLE Drill is the reason I'm writing this letter. *I've used a lot of electric drills but there isn't any around that is made that can beat the SIOUX.* With that drill, you can get into the tightest place that you can put your fist into.

You can put oversize drills into it and it won't die out on you. It's the most compact, the most rugged piece of equipment I've used. It couldn't be designed any better, I don't think, and whoever had the brains to design that really deserves a lot of credit.

He must have had us in mind when he designed it because it's *perfect*. In our kind of work we have to be fussy and we don't pass out compliments too easy, but there are so many poorly designed tools for sale, that I really thought you deserved these compliments.

I've never written to a manufacturer before but I appreciate working with good tools and I have to give your drill a lot of credit for our prize winning cars. A lot of people have bought the offset drill after using mine. It sells itself very easily.

You're perfectly welcome to do as you please with this letter, and I would endorse any of your products."

JOHN SHARRIGAN, Watertown, Mass.

SIOUX

ALBERTSON & CO., INC.

SIOUX CITY, IOWA, U.S.A.

LOOK UNDER ELECTRIC TOOLS

ELECTRIC DRILLS • SCREW DRIVERS • SANDERS • GRINDERS • IMPACT WRENCHES • VALVE FACE GRINDING MACHINES • POLISHERS • PORTABLE SAWS • FLEXIBLE SHAFTS • ABRASIVE DISCS

Bright highlight along lower face of ring shows pre-seated area from factory lapping.

You have no long break-in period with PEDRICK Chrome Rings. Almost immediately you get the full benefits of the Chrome surface which is practically scuffless, which withstands high temperatures, abrasion and corrosion, and which increases ring life up to four times.

This is so because PEDRICK laps or pre-seats its Chrome rings to cylinder size at the factory. This reduces break-in time up to 80% and enables the engine to be put under full load very quickly, with all the benefits of Chrome. Furthermore, PEDRICK Chrome rings are the most-modern twist-seal or taper-face designs, which in themselves speed seating and assure a quick, positive seal.

So, for the very best in quality, the very latest in engineering design, make your rings PEDRICK. Let our engineers cooperate with you on special problems. Write, wire or phone: WILKENING MANUFACTURING CO., Philadelphia 42, Penna., SAratoga 9-3770.

Pedrick PISTON RINGS

PEDRICK PIONEERED *Conformable* PISTON RINGS FOR BIG-BORE ENGINES

DIESEL FUEL and LUBRICATION

BULLETIN

CITIES SERVICE

TESTS SHOW CITIES SERVICE C-300 OIL HAS LOWEST BEARING LOSS

L-4 72 Hr. Engine Run

Bearing Loss, Ave mg.

CITIES SERVICE C-300 OIL	Brand A Oil	Brand B Oil	Brand C Oil	Brand D Oil	Brand E Oil	Brand F Oil	Brand G Oil
54	550	106	170	1109	601	89	1425

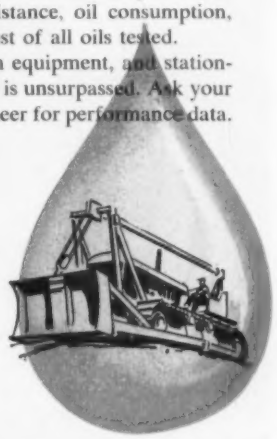
New test data reveals excellent reasons why sales of Cities Service C-300 Oil have doubled in two years.

These tests, comparing C-300 with 7 leading competitive oils, demonstrate that it has by far the lowest bearing loss of all oils tested.

In addition, the over-all performance rating of Cities Service C-300—which takes into account all aspects such as corrosion and oxidation resistance, oil consumption, and detergency—was also highest of all oils tested.

For diesel trucks, buses, farm equipment, and stationary diesels, Cities Service C-300 is unsurpassed. Ask your Cities Service Lubrication Engineer for performance data.

CITIES SERVICE DEVELOPS NEW OIL FOR SEVERE-DUTY EARTH MOVING MACHINERY



To meet the exacting requirements of certain severe-duty earth movers now manufactured by the Caterpillar Tractor Company and others, Cities Service has developed an extremely rugged new oil.

Known as Cities Service C-500, this new oil is approved by Caterpillar and specially made for service as a Series 3 Oil.

Your lubrication engineer will gladly discuss the features of this new oil and the precise machinery and conditions for which it is intended.

OVER 10,000 HOURS WITH CITIES SERVICE C-400 OIL— PISTONS CLEAN AS NEW!

A Mississippi tug was having trouble. Ring breakage and oil consumption made overhaul necessary practically every time it was docked.

Then Cities Service C-400 Diesel Engine Oil was tested.

Result: After over 10,000 hours, pistons were like new. No stuck or broken rings. Horsepower was increased 5%. Oil consumption chopped in half!

This story is typical of the kind of problems Cities Service solves throughout the year. If you have lubrication difficulties, consult your Cities Service Lubrication Engineer . . . it may save you a bundle.

MAN YOU SHOULD KNOW

William J. Varetoni is a Lubrication Engineer and Technical Consultant with the Cities Service office at 60 Wall Street, New York, N. Y. With 27 years' experience in the solution of lubrication problems, he is typical of the many Cities Service Lubrication Engineers who will gladly investigate your problems without obligation. A call to the nearest Cities Service office will bring one of these men to your plant or job site.

Typical of the 30 General Motors Training Centers, offering one-week courses in Delco-Remy equipment, is this Detroit unit.

THROUGH THESE PORTALS pass the best-trained heavy-duty electrical specialists in the business!

Nowadays the key to profit in truck and bus service lies in the speed and efficiency of your operations. To help you reach that level of efficiency, General Motors Training Centers offer you a one-week training course in Delco-Remy heavy-duty electrical equipment—without tuition or obligation. With 30 of these schools throughout the United States, chances are there's one near you.

Designed to teach speed and efficiency, this course gives you or your men a thorough grounding in up-to-date service methods and factory-specified procedures. Expert factory-trained instructors, using the modern testing and service equipment, are your teachers.

The checking, testing and repairing of Delco-Remy heavy-duty voltage regulators, generators, cranking motors, distributors and other units are covered in the most efficient way—through classroom and practical shop experience.

There is no tuition for the course. Tools, equipment and supplies needed during the training period are provided at no cost. The student's only expenses are his transportation, meals and accommodations.

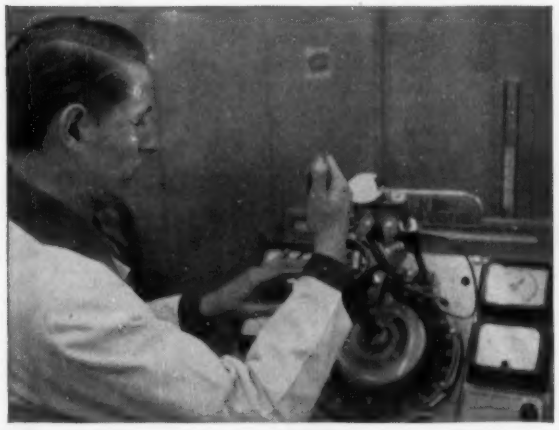
If you are engaged in truck and bus electrical service, apply for this outstanding course for yourself or for your men. To arrange for admission, write direct to Service School, Delco-Remy, or contact your local United Motors System distributor.

GENERAL MOTORS LEADS THE WAY—STARTING WITH

Delco-Remy

ELECTRICAL SYSTEMS

DELCO-REMY, DIVISION OF GENERAL MOTORS, ANDERSON, INDIANA

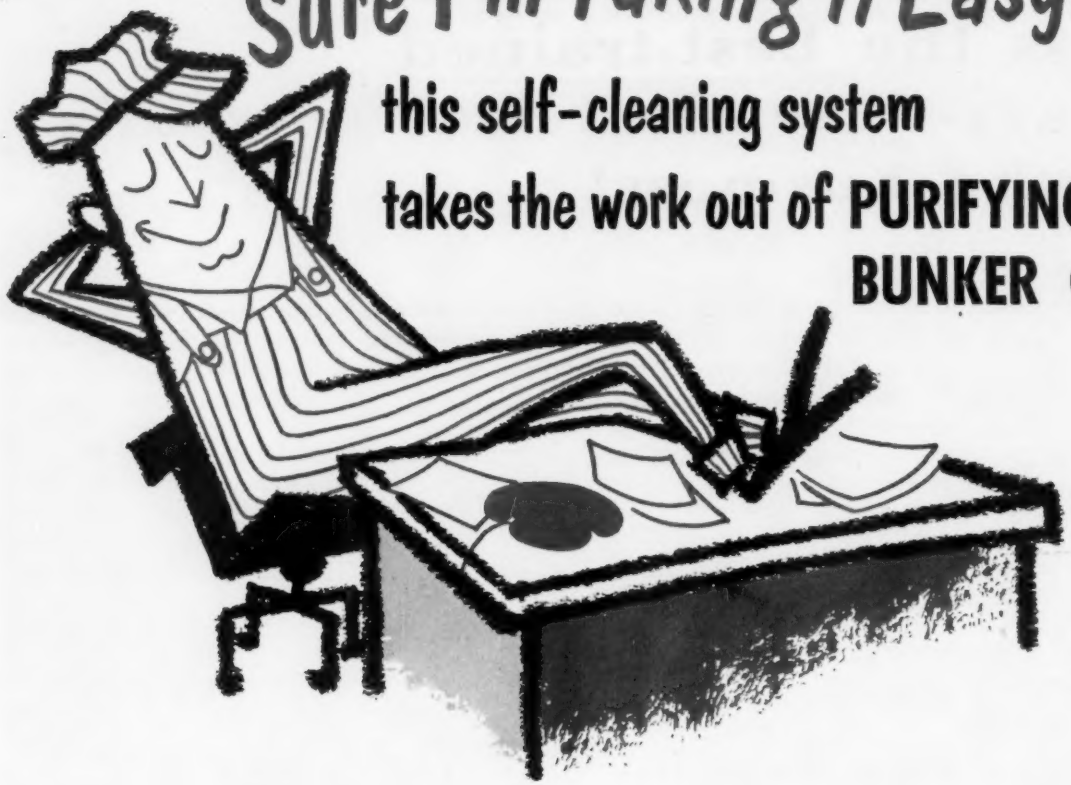


Only the most up-to-date testing equipment is used. Here a student adjusts a truck distributor on a testing machine.

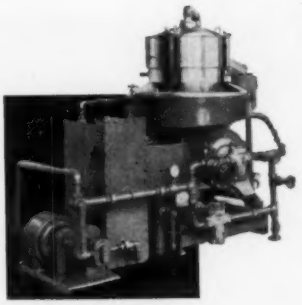
Working with small groups, instructors are able to teach a great deal of automotive electricity in a short time.

Sure I'm Taking it Easy...

this self-cleaning system takes the work out of PURIFYING BUNKER C



The old and costly headache of frequent shut-downs for bowl cleaning is a thing of the past with the automatic Sharples Oil Purification System—the high capacity system that is self-flushing. Economy-minded diesel operators everywhere are finding that the significant answer to the use of low cost heavy fuel starts with a Sharples.



Get the facts about the savings that can be yours with continuous residual oil purification by Sharples.

SHARPLES

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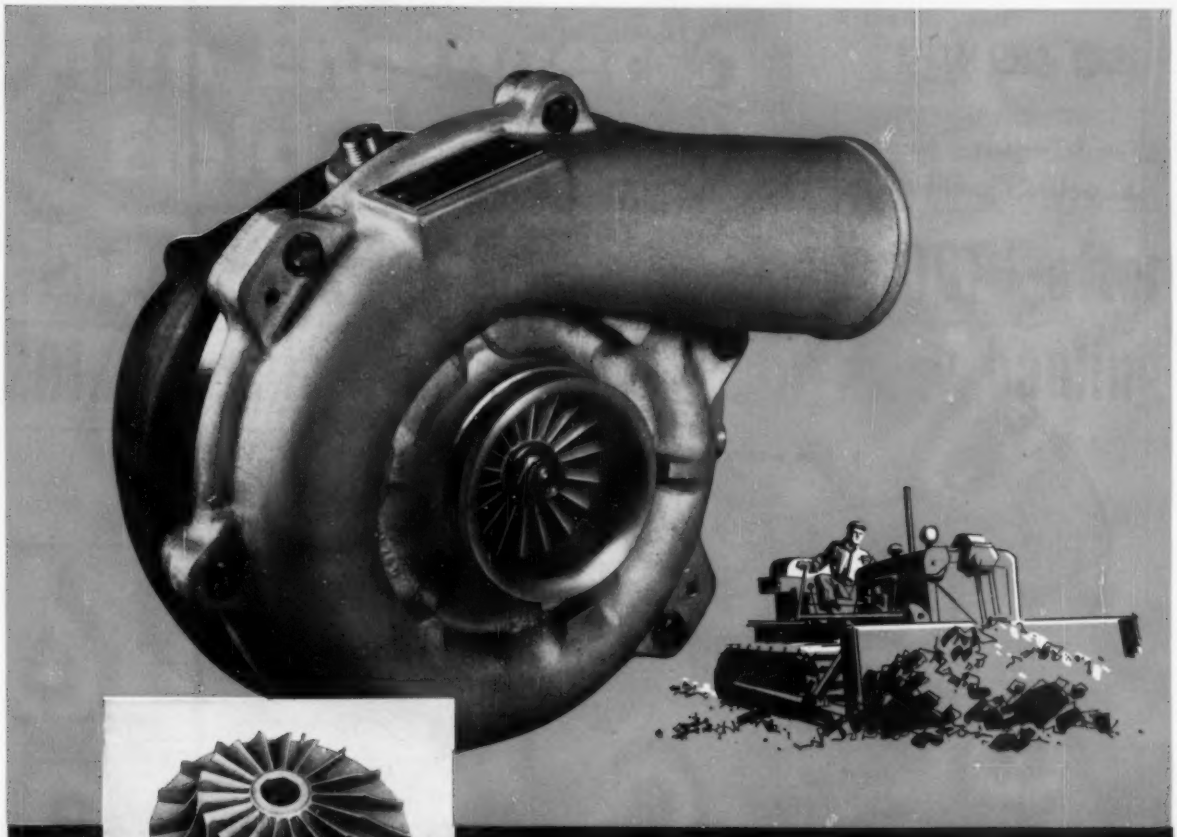


NEW! Improved Vane Design

Gives Thompson Turbochargers More Capacity at Lower Speeds

Only Thompson Turbochargers have simple, straight rotor vanes which provide the economy of high-pressure supercharging at low rotor speeds. This compact, simplified design is based on the Jet Division's years of experience with air- and gas-powered air compressors. Air-foil vane sections of the turbine and compressor wheels have been developed in the Jet Division lab.

In new Thompson Turbochargers you'll find many other ways in which aircraft performance has beeen combined with automotive simplicity and ruggedness. One-piece bearings simplify maintenance . . . rugged turbine design means longer life . . . compact, space-saving design facilitates installation.

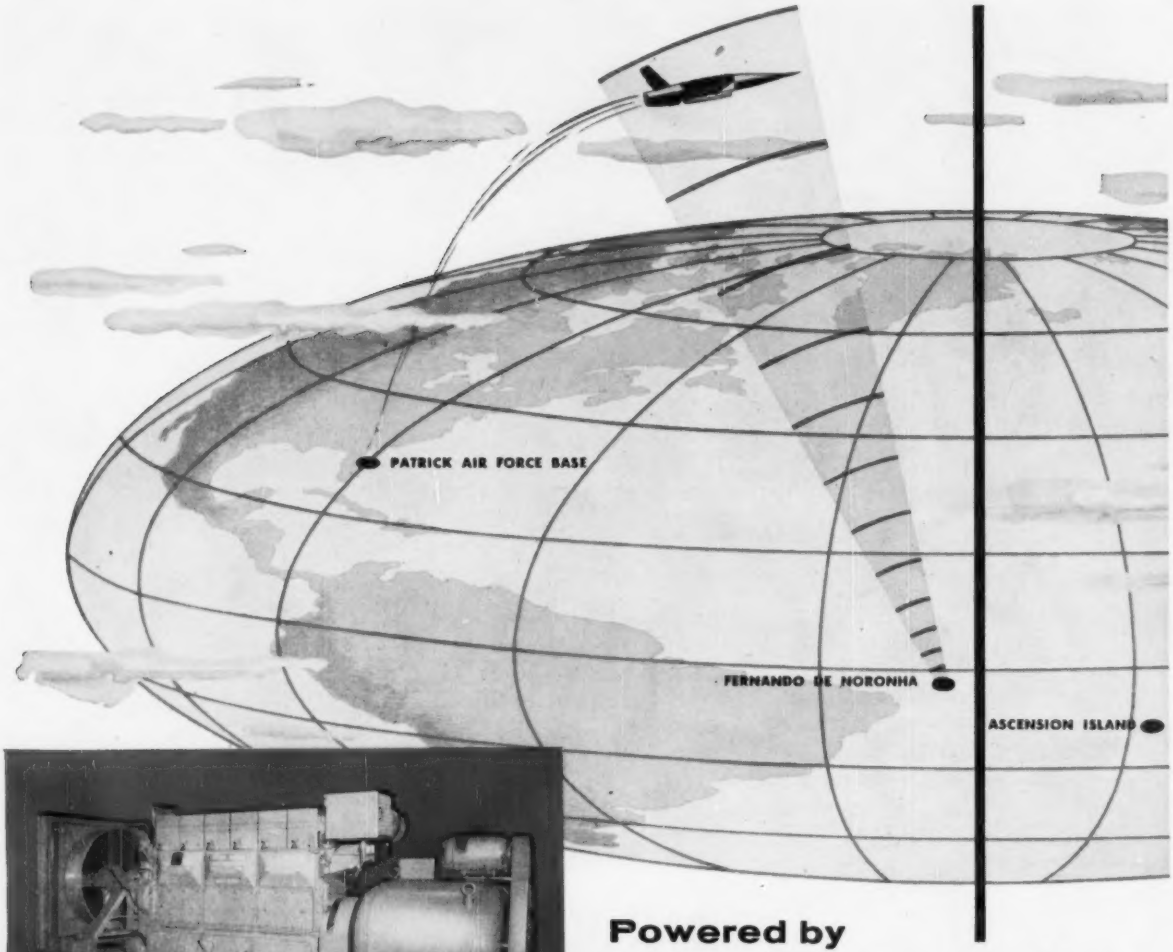
New Thompson Turbochargers are available in sizes to efficiently blow diesels from 50 to 300 horsepower. Our engineers will welcome an opportunity to show you how Thompson Turbochargers can help you achieve up to 100% increases in horsepower, with a reduction in fuel consumption.

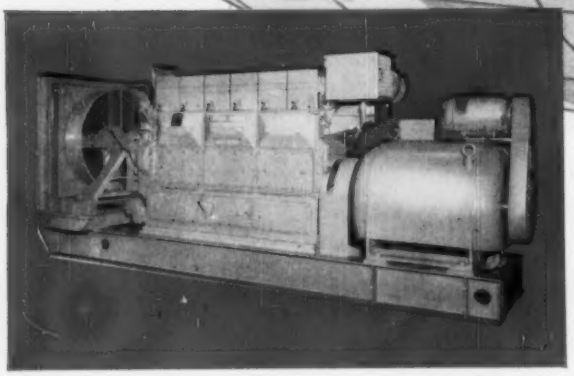
Write on your company letterhead for Booklet DP-257, containing detailed information on Thompson Turbochargers.

JET DIVISION

Thompson Products, Inc.

Cleveland 17, Ohio





Powered by WHITE'S Superior Diesels

Down-Range Stations will Track U.S. Guided Missiles

Along a 4,400 mile testing corridor sweeping from Florida southeastward to Britain's Ascension Island, U.S. guided missiles burn their way through tropical Atlantic skies. Soon new radar eyes will be following their flight from atop tiny rocky islands located hundreds of miles from any power station. The U.S.-built tracking and control stations will fill gaps along the missile path . . . will be watching, recording, and ready to explode the missile in air should its behavior become erratic!

Because the guided missile program is vital to U.S. defenses—yet must be conducted with full protection to lives and property—dependability of every piece of tracking equipment is doubly essential. Dependable White's Superior Diesel engines meet the U.S. Air Force requirements for supplying power on this down-range project. These high-quality, heavy-duty engines are world renowned for their continuous, dependable operation and easy starting. Superior's precision construction provides long, trouble-free performance with low maintenance and utmost fuel economy.

Portions of other strategic U.S. defense systems, like the "Texas Towers" (Early Warning Radar Stations), the "DEW" line (Distant Early Warning), and the "SAGE" project (Semi-Automatic Ground Environment), will also rely on Superior engines—proof again of their rugged dependability. If your requirements range from 215 to 2150 horsepower, or 150 to 1500 KW, benefit from White's many advanced Superior design features! *Get complete information now!*

Superior ENGINES ATLAS Imperial DIESEL ENGINES White DIESEL

White Diesel

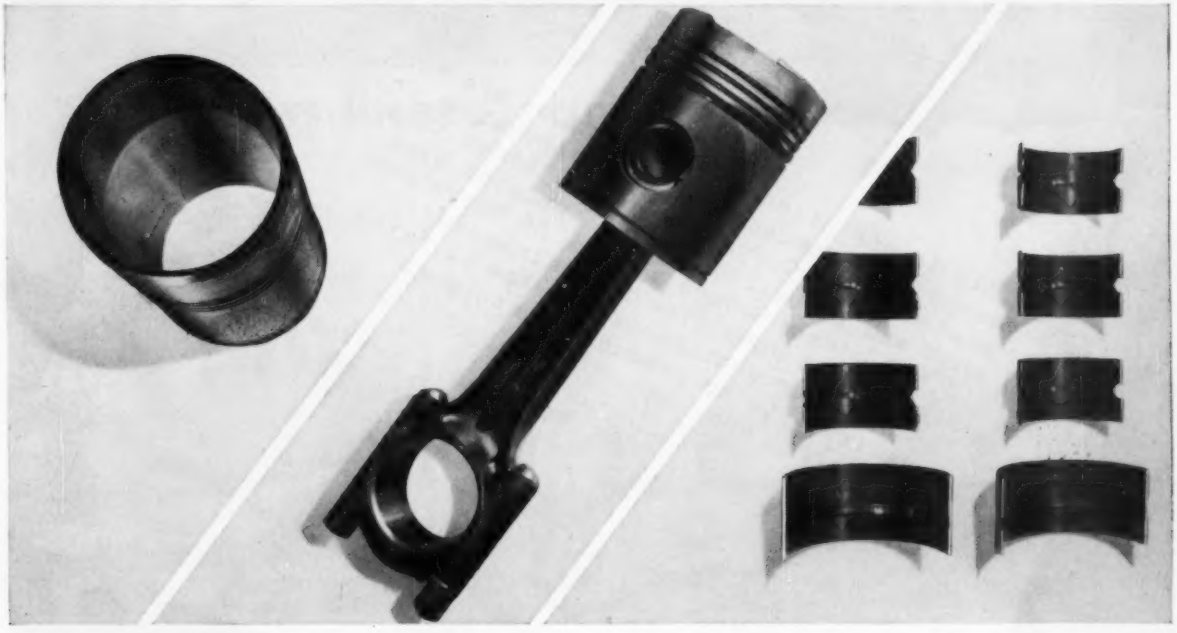
WHITE DIESEL ENGINE DIVISION

THE WHITE MOTOR COMPANY Plant and General Offices: Springfield, Ohio

The Engineer's Field Report

CASE HISTORY
RPM Delo Oils
LUBRICANT
Progressive Transportation Co.,
FIRM Compton, California

RPM DELO holds piston wear to .001" after 201,253 miles of on-and-off highway hauling



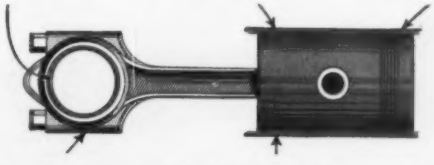
LUBRICATED WITH RPM DELO Oil, these engine parts were pulled from a Cummins HR diesel after 201,253 miles. A portion of this mileage was put on during four months of rugged service spotting loads of heavy pipe in the Arizona desert. When the engine was taken down, after two years of this on- and off-highway hauling, Progressive Transportation Co. found RPM DELO Oil had kept lacquer, gum, sludge, and deposits from forming...rod bearing wear varied between .0005 and .001 inch and pistons showed maximum wear of only .001". No wear at all evident on main bearings. Progressive Transportation uses RPM DELO Oils in all its large fleet of tractors—some of which have traveled well over 200,000 miles without overhaul.

Why RPM DELO Oils prolong engine life

Special compounds stop corrosion

Anti-oxidant resists lacquer formation

Detergent keeps all parts clean



Metal-adhesion qualities keep oil on parts in running or idle engines—inhibitor resists foaming

LUBRICATING OILS RPM DELO

For More Information... about this or other petroleum products of any kind, or the name of your nearest distributor, write or call any of the companies below.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • **STANDARD OIL COMPANY OF TEXAS**, El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • **THE CALIFORNIA COMPANY**, Denver 1, Colorado

Gene:
Here's another excellent customer report of Cooper-Bessemer compressor performance.
Mike

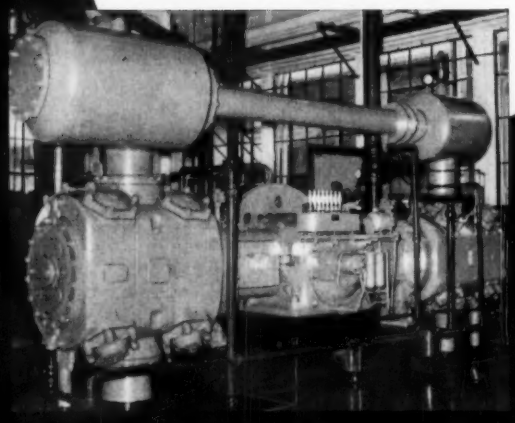
*Excerpt from a letter written by the Plant Engineer of one of Firestone's foreign subsidiaries.

*This is one piece of equipment we are very happy to recommend to all prospective customers of Cooper-Bessemer. Since this unit was installed, it has operated over 13,800 hours, 6 days a week, 24 hours per day without down time for maintenance. It has given continuous service at rated capacity with no production stoppage or material spoilage.

Very truly yours,

R. J.

Plant Engineer



Cooper-Bessemer motor-driven EM compressor in a tire manufacturing plant of The Firestone Tire and Rubber Company. This heavy-duty unit, rated 200 hp at 450 rpm, efficiently handles the compression of air from atmosphere to 100 psig.

BRANCH OFFICES: Grove City • New York
Chicago • Washington • San Francisco • Los Angeles
Houston • Dallas • Odessa • Pampa • Greggton
Seattle • Tulsa • St. Louis • Kansas City • Minneapolis
New Orleans • Shreveport • Casper

SUBSIDIARIES: Cooper-Bessemer of Canada, Limited . . . Edmonton • Calgary • Halifax.
Cooper-Bessemer International Corporation . . .
New York • Chacao • Havana • Mexico City.

Cooper Bessemer

GENERAL OFFICES: MOUNT VERNON, OHIO

ENGINES · GAS · DIESEL · GAS-DIESEL
COMPRESSORS · RECIPROCATING AND CENTRIFUGAL
ENGINE OR MOTOR DRIVEN

On express lines . . . and at whistle stops . . .

The performance and the brand are the same around the world

Other Outstanding Shell Industrial Lubricants

Shell Tellus Oil—for closed hydraulic systems

Shell Alvania Grease—multi-purpose industrial lubricant

Shell Turbo Oil—for utility, industrial & marine turbines

Shell Dromus Oils—cutting oils for high-production metalworking

Shell Rimula Oil—for heavy-duty diesel engines

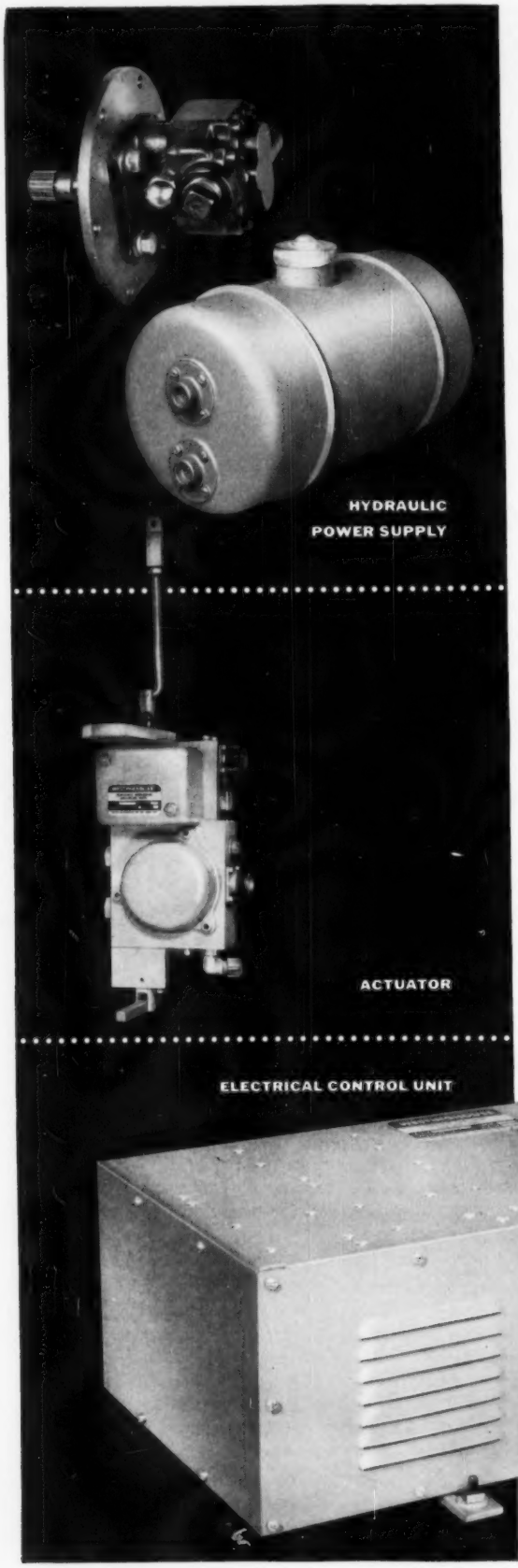
SHELL TALONA R Oil 40 offers two outstanding reasons for its acceptance as a top-rated diesel-electric locomotive lubricant. It provides superior anti-wear protection and maintains engine performance.

Greatly reduced wear on pistons, rings and cylinder liners is assured because of the selected combination of additives used in Talona® R Oil 40. It has high oxidation stability, combined with resistance toward corrosion and sludge formation. It prevents ring fouling and provides excellent detergent-dispersant action.

Today—railroad operators abroad can enjoy the same Talona R Oil 40 the domestic carriers rely upon. For complete information, write to Shell Oil Company, 50 West 50th St., New York 20, N.Y., or 100 Bush Street, San Francisco 6, Calif.

SHELL TALONA R OIL 40

SHELL



Opening the way to new engine control accuracy

Westinghouse electric governors actually predict speed changes . . . react faster than any other

Now, Westinghouse offers the fastest acting electric governor in history. It senses electrical load change . . . anticipates speed change. It is much faster acting than the conventional governor which must wait for actual speed change.

The Westinghouse electric governor also provides for automatic isochronous load sharing by two or more engine-generator sets. Electric frequency (speed) sensing, another prime feature in the Westinghouse electric governor, eliminates the need for expensive and troublesome mechanical speed-drive systems.

This accurate, dependable governor is easy to maintain . . . no tubes or other frail parts . . . operator attention is cut to minimum.

FOR ALL THE FACTS, write Westinghouse Electric Corporation, 3 Gateway Center, Pittsburgh 30, Pennsylvania. Ask for B-6757. J-22045

YOU CAN BE SURE...IF IT'S

Westinghouse

3 dependable products for the diesel industry

DE LAVAL IMO PUMPS

De Laval IMO pumps do a dependable job during long years of service. The reason is IMO design simplicity. De Laval IMO's have only three moving parts—smoothly intermeshing rotors that propel the fluid axially in a steady flow without churning, pocketing or pulsation. There are no reciprocating parts to wear or become noisy. Quiet, compact IMO pumps are excellent for direct-connected, high-speed operation. They can be furnished in capacities to 1,000 gpm and pressures to 1,500 psig.

DE LAVAL HYDRAULIC FAN DRIVES

De Laval Hydraulic Fan Drives for air cooled heat exchangers and cooling towers offer these important advantages. They *save* power since the fan operates at full speed only a portion of the time. They provide *accurate, automatic* control of engine jacket water temperature, and also assure complete operational flexibility. These units stay on the job for years. As shown, both IMO motor and speed reducer are mounted and factory aligned on a single bedplate.

DE LAVAL HIGH PRESSURE TURBOCHARGERS

De Laval turbochargers offer pressure ratios of 3:1 as well as higher compressor and turbine efficiencies than those found in conventional turbocharger systems. Output of heavy duty diesel, gas and dual-fuel engines may be doubled by De Laval turbochargers without increasing thermal loading. Exclusive Monorotor design offers a compact lightweight unit of sturdy construction. De Laval turbochargers are self-adjusting to engine loads, can be used on 4- *and* 2-cycle engines.

You'll find additional data in these De Laval Bulletins. Write for your copies.

DE LAVAL

Steam Turbine Company

TRENTON 2, NEW JERSEY

Mr. Edward Gutschmidt
Fleet Superintendent

In fleet service . . .

"We just don't have bearing trouble"

The Bend-Portland Truck Service covers central and southeast Oregon. Established in 1927 this progressive company has continued to grow because of an area-wide reputation for service and efficiency.

Recently Mr. Dale Huff of The Cleveland Graphite Bronze Co. interviewed Mr. Edward Gutschmidt, fleet superintendent, as to freight services and engine bearing performance. We believe you will find highlights of this discussion and the performance record of Clevite 77* bearings informative and impressive.

Q Mr. Gutschmidt, what is the major portion of your business?

A Primarily we deal in auto freight and typical scheduled carrier services.

Q How about equipment? What do you have?

A Let's see, 19 road rigs and 54 city trucks. If you include trailers and company cars it totals around 125.

Q With regard to make, do they vary?

A Yes, our fleet includes eight different makes.

Q What would you consider the length of an average haul?

A Well, our longest haul is about 500 miles and the shortest 120. Our average, however, would be about 200 miles.

Q How are driving conditions over your routes?

A They really vary. We travel from sea level to 4000 feet and run into every conceivable condition. Temperatures go down to 30 below in winter and as high as 110 during the summer.

Q What about annual milage?

A Each road rig averages about 100,000 every year. The city fleet about 8,000.

Q I assume you handle your own maintenance?

A That's right, we have a fully equipped maintenance shop.

Q When it comes to engine bearings do you have a preference?

A Yes, our number one choice is Clevite 77. We've been using them for about 10 years.

Q Why Clevite?

A Mainly because we have yet to find a better bearing. We have run main bearings 400,000 miles and rod bearings up to 225,000.

Q Going back for a moment, why did you start using Monmouth Clevite 77 bearings?

A Because they are equal in quality and material with original equipment.

Q Do you have an established bearing maintenance program?

A Truthfully, we never worry about bearings until there is some other work to do on the engine. We just don't have bearing trouble.

Day after day fleet operators everywhere learn that Clevite 77* is the finest high-duty engine bearing obtainable. Its patented tri-metal construction provides greater fatigue strength, corrosion resistance and a superior running surface.

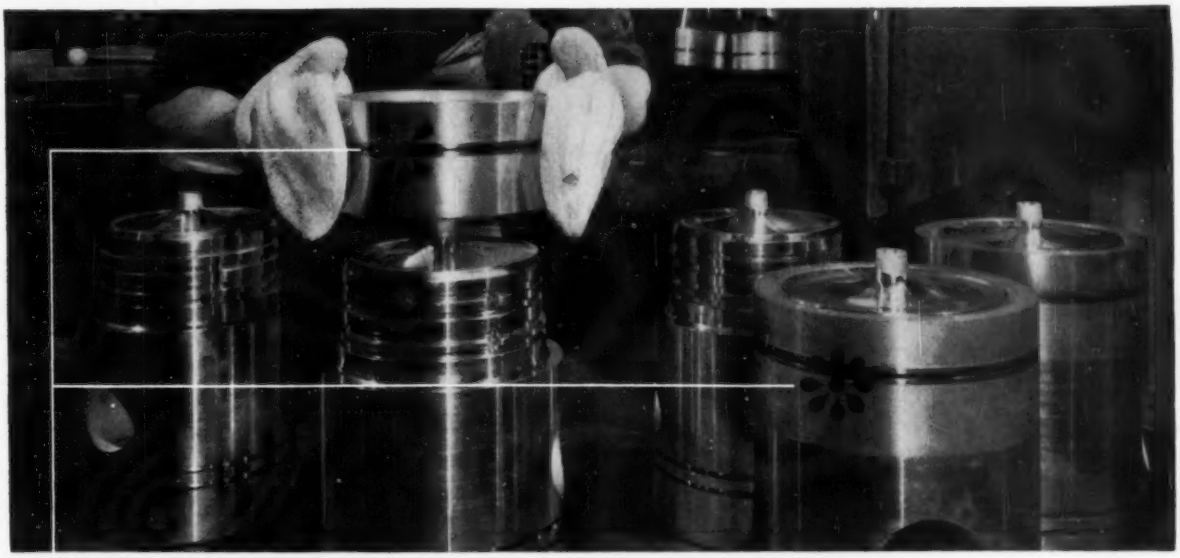
To improve engine performance . . . to cut "down time" . . . to reduce maintenance costs . . . contact the nearest N.A.P.A. jobber for Monmouth bearings.

*The words Monmouth, Clevite and Micro are registered trade marks of Clevite Corporation

Monmouth
ENGINE BEARINGS

CLEVITE SERVICE

The Cleveland Graphite Bronze Co.
Division of Clevite Corporation
Cleveland 3, Ohio, U.S.A.



"Bonded-In" Ni-Resist Forms Top Ring Grooves. Because the thermal expansion of Ni-Resist matches that of aluminum, Ni-Resist inserts can be permanently bonded in. Bonding is by Al-Fin Process, developed by Fairchild Engine and Airplane Corp., Deer Park, L. I., N. Y.

Most Powerful Harbor Tug in the United States. Squat, pug-nosed Kings Point is powered by a 2100 HP ALCO diesel with forged aluminum pistons. All 16 pistons are equipped with Ni-Resist inserts at the top compression ring groove. The Kings Point operates out of Baltimore for the Curtis Bay Towing Company, Baltimore, Md.

Ni-Resist ring carriers keep her powerful new diesel powerful longer

Once ring grooves lose their shape, through wear, galling and heat, down goes compression, power and efficiency. To strengthen this critical point, pistons on the Kings Point's engine are protected with Ni-Resist* nickel cast iron in the top ring groove area.

Ni-Resist ring carrier inserts hold their shape longer, and keep this powerful diesel powerful.*

Ni-Resist iron effectively resists wear, corrosion at diesel operating temperatures. Ni-Resist inserts remain tight in piston service.

Ni-Resist ring carrier inserts, cylinder liners, valve guides, and exhaust manifolds can reduce your maintenance problems. Fill out the coupon on the right if you want to know how Ni-Resist can extend the life of your diesel equipment.

*Registered trademark

The INTERNATIONAL NICKEL COMPANY, Inc.
67 Wall Street New York 5, N. Y.

INCO TRADE MARK

The International Nickel Co., Inc.
67 Wall Street, New York 5, N. Y.

Gentlemen:
Please send me "Keep 'Em Rolling" and "Engineering Properties and Applications of Ni-Resist."

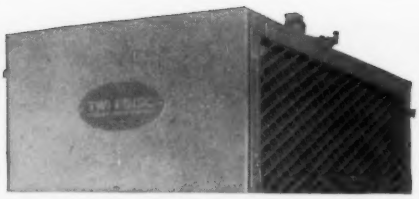
Name_____

Title_____

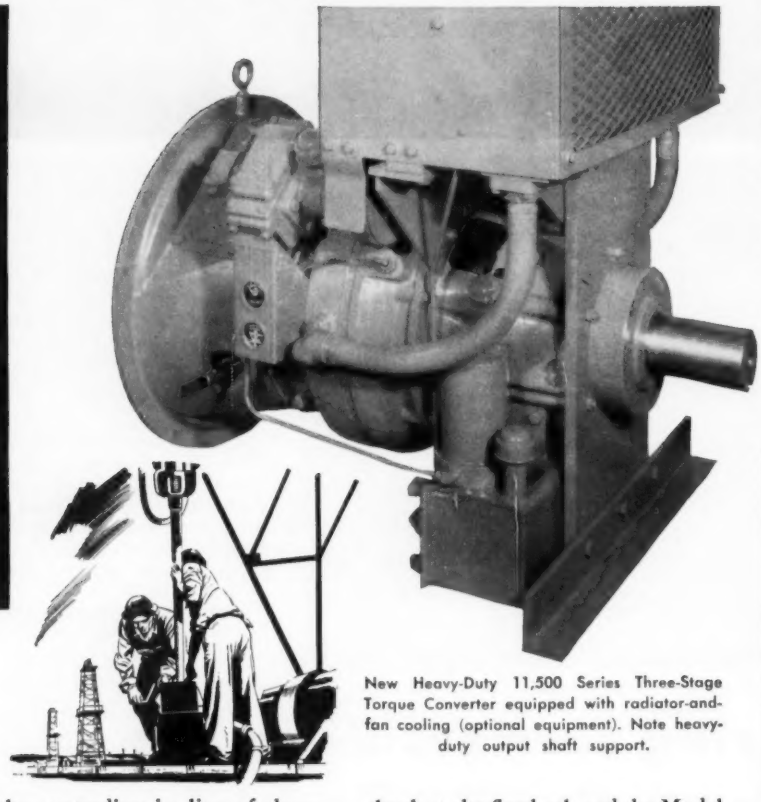
Company_____

Address_____

City_____ Zone___ State_____



Twin Disc announces new Heavy-Duty 11,500 Series Torque Converter



New Heavy-Duty 11,500 Series Three-Stage Torque Converter equipped with radiator-and-fan cooling (optional equipment). Note heavy-duty output shaft support.

Further extending its line of three-stage torque converters, Twin Disc Clutch Company now offers industry an additional version of its popular 11,500 Series Three-Stage Torque Converters.

Designated the Heavy-Duty 11,500 Series (a Standard-Duty version will be continued), the new units have a maximum rating of 586 hp at 2200 rpm. Maximum input torque is 1400 pound-feet. Impellers are available for specific torque ratings of 340, 390, 450 and 540 pound-feet.

Current production units include the Model CF, which provides a clutch at the flywheel, and the Model F, which is connected to the flywheel with a driving ring.

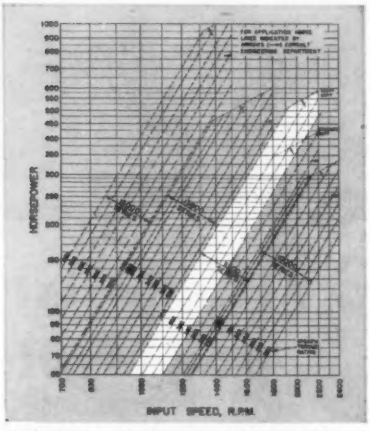
A Twin Disc C-3 Rear End, with the output shaft supported by two heavy-duty roller bearings, is available with either model, permitting maximum output sidepull.

The complete line of Twin Disc Three-Stage Torque Converters includes five distinct sizes; the 10,000 Series, Standard-Duty 11,500 Series, Heavy-Duty 11,500 Series, 13,800 Series and the 16,000 Series. The line offers 33 specific torque ratings and input and output arrangements to meet virtually every industrial requirement from 60 to 1000 hp and from 700 to 2400 rpm.

These three-stage torque converters have long proved themselves on such applications as crawler tractors, drilling rigs, shovels, yarders, locomotives and many, many others. They offer such advantages as multiplying engine input torque (up to 6:1) exactly as required by load . . . cushioning out destructive shocks and vibrations . . . minimizing maintenance and downtime . . . and *producing more work on a hp-cost basis.*

Twin Disc, the only manufacturer producing both three-stage and single-stage designs, offers single-stage torque converters for engines producing 30 to 212 hp. Besides this, Twin Disc makes available a complete line of fluid couplings, to 850 hp, and friction clutches, to 1050 hp.

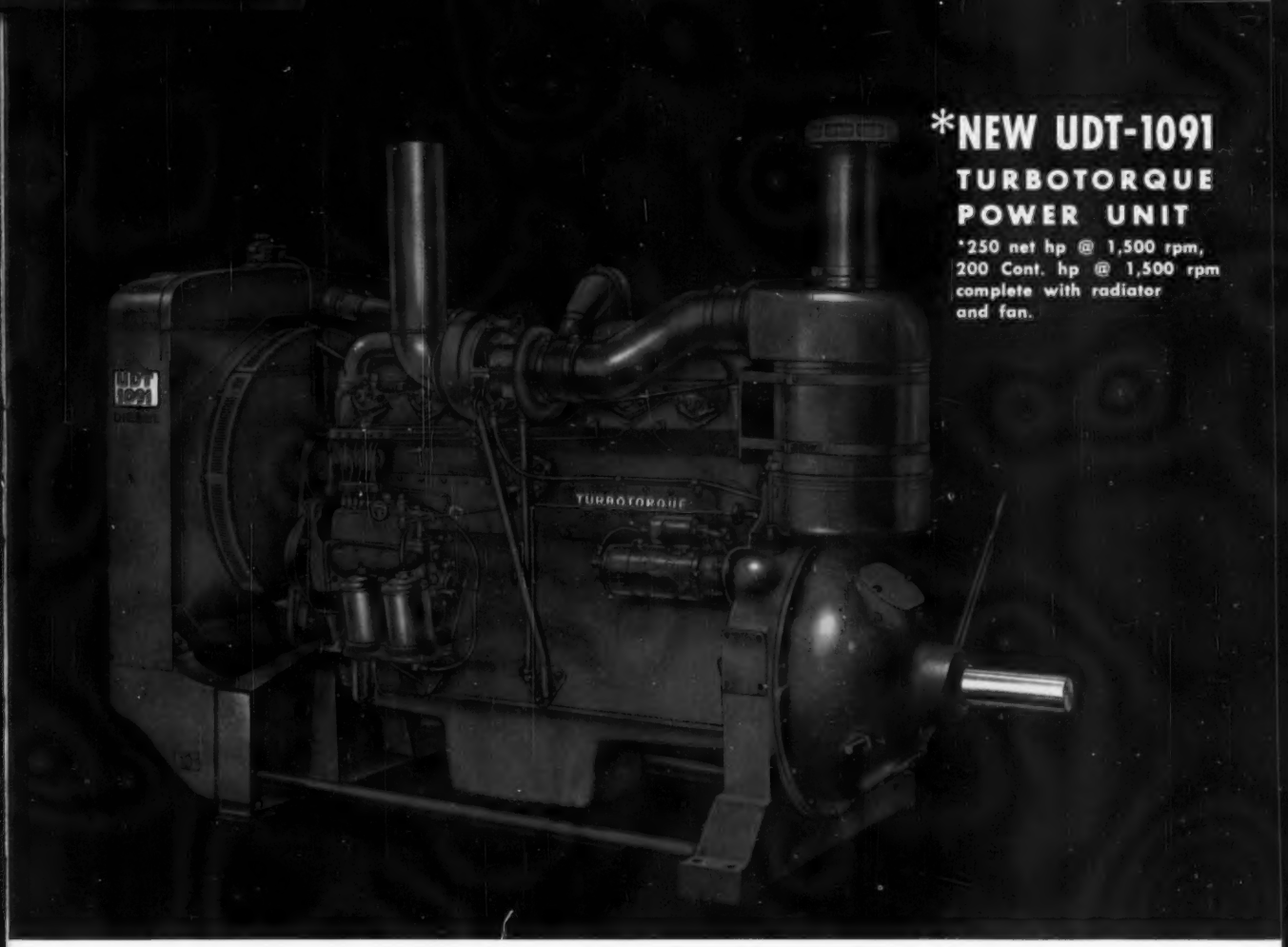
Twin Disc Clutch Company, Racine, Wisconsin; Hydraulic Division, Rockford, Illinois . . . with parts and service facilities throughout most of the world.



Unshaded area in above curves compares hp and rpm characteristics of the Heavy-Duty 11,500 Series Torque Converter with other Twin Disc Three-Stage Torque Converters.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC
Torque Converters



New 250 hp *Turbotorque International . . . power cost-cutter for your big machines

Now—lower cost, more dependable power for your big driven machines—the new 250 hp Turbotorque International UDT-1091 power unit. And that's on-the-job shaft horsepower—not the inflated laboratory variety against which big deductions must be made for fan, radiator, accessories, plus altitude and air temperature.

This instantly available 250 hp, along with an extra-large counterbalanced crankshaft and heavy flywheel, carries you through peak loads that stall lighter weight engines. As a result, you can make full use of the continuous duty 200 hp rating for more production at lower cost.

The UDT-1091 has all the features that have made the 200 hp naturally aspirated UD-1091 a favorite diesel power source. In addition, it has a water-cooled oil temperature stabilizer as regular equipment and a radiator with greatly increased cooling capacity. The efficient exhaust-gas-driven AiResearch turbocharger moves 60% more air through the big 14-in. diameter air cleaner. This air is packed into the cylinders for minimum fuel consumption and higher power with lower exhaust gas temperatures.

Get the full story on the new UDT-1091 and the other 17 International high-output engines from your nearby International Power Unit Distributor or Dealer. His parts and service support is as dependable as the engines he sells! Call him soon.

INTERNATIONAL®

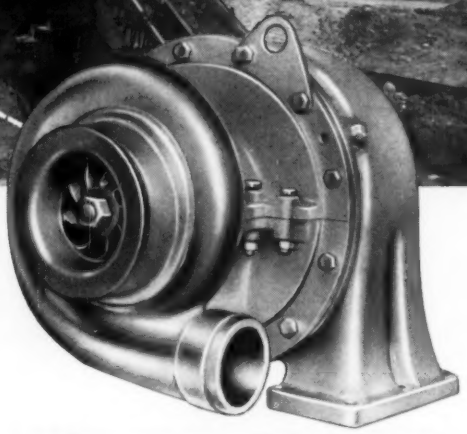
International Harvester Company
180 North Michigan Ave., Chicago 1, Ill.

CONSTRUCTION EQUIPMENT

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

AIRESEARCH TURBOCHARGERS BOOST INTERNATIONAL HARVESTER DIESEL POWER RATINGS

AIRESEARCH TURBOCHARGED *International Harvester UDT 1091 diesel is used to power this rock crushing equipment 5000 feet high at Pueblo, Colorado. Rock crushed is from 10 inches maximum to one inch minus with a 40% crush. The AiResearch turbocharger has increased the rock crusher's production by 20%, and not only boosted horsepower 20 – 30% over the diesel's previous output at that level but actually raised it over its sea-level rating. Approximately 1800 tons of rock are being crushed in eight hours by the turbocharged UDT 1091 compared with 1400 tons in an equal period with a non-turbocharged unit. The AiResearch turbocharged UDT 1091 prevents stalling under heavy loads and has operated for over 2500 hours at elevations in excess of 5000 feet with no "down time."*



AIRESEARCH C-60 TURBOCHARGER NOW AVAILABLE ON INTERNATIONAL HARVESTER UDT 1091 DIESEL ENGINE

Installation maintains sea-level output up to 12,000 feet with an important decrease in fuel consumption

AiResearch turbochargers have an outstanding record of operation in the field. Features include turbine wheels of unmatched efficiency, air-cooling which eliminates the need for complicated plumbing and ease of installation and maintenance. Thermal loading on the engine is lower by comparison than any other turbocharging or supercharging installation. Your inquiries are invited.

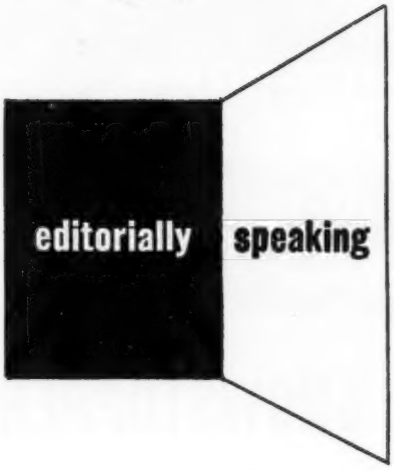
BASIC SPECIFICATIONS FOR AIRESEARCH TURBOCHARGERS					
MODEL	F-51	C-60	A-60	E-100	B-100
Diameter — in. nom.	10	11.5	15.25	15.1	15.4
Length — in.	10.5	12.9	16.75	14.7	17.1
Weight — lb.	40	95	125	112	135
Output — lb/min. (Standard Conditions)	29-51	30-60	38-60	50-100	60-100

THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS



A Question of Ethics (?)

Bought parts to rebuild a master brake cylinder last week. Wanted original parts and so went to the car dealer. Ten minutes of rummaging and the parts man said, "No got." Another dealer; same result. Needed the car and so went up the block to a jobber. He had the kit, we bought it and the car was on the road in an hour. Got to thinking how this whole act, with variations, can and does happen in our industry. And there's a lot of talk going around about a repairman's use of other than OEM parts as being "unethical". Let's take a look. We wanted OEM parts even though slightly higher than those bought. Our reason was not "ethics"; it was practical—to get protection of the builder's reputation and warranty. Most others feel the same way. But we wanted to get running, OEM parts were not available, so we bought others. Suppose that instead of a car, this had been a key machine with downtime gulping dollars. Would you seriously expect the owner to do differently? So in this context, being "ethical" or "unethical" depends on OEM parts availability! Actually, the word is misapplied; it should be saved for some of the *really* unethical practices in the field. Somewhere along the line, there are manufacturers who have lost sight of today's realities. And the fact that their primary responsibility is to the user—the guy at the end of the line that keeps us all eating. Try to sell the man with a bad injection pump on using OEM parts and then tell him, yes, he'll get his parts in three weeks. However, manufacturers have a point. Their nameplate is on the equipment and they take an unwarranted rap if someone else's parts are used and fail. The remedy is simple. Make their parts readily available at right prices. Then sell the idea that it's good business to use OEM parts. Otherwise, there are some mighty good replacement parts around at good prices. And some bad ones. Caveat emptor! Call it "ethics", company policy, what you will, but if it isn't geared to the needs of the ever-loving customer, we don't have to tell you what to do with them, he probably will.

B P E

LONG-RUNNING
SMASH HIT!
DIESEL SHOWSTOPPER-
Sealed Power
CHROME-CYCLAN
PISTON RINGS
RAVE NOTICES:
"Tops for every diesel application..."
Diesel Engineer
"They beat heat, breakage and side-wear..."
Shop Super
"Chrome and Cyclan Piston Rings reduce friction and corrosion..."
Fleet Owner
"These rings break in fast. They last... and last..."
Railroad Diesel Mechanic
SEALED POWER CORPORATION • MUSKEGON, MICHIGAN • ST. JOHNS, MICHIGAN • ROCHESTER, INDIANA
DETROIT • 7-236 GENERAL MOTORS BUILDING • PHONE TRINITY 1-3440
Sealed Power Piston Rings
PISTONS • CYLINDER SLEEVES
Leading Manufacturer of Automotive and Industrial Piston Rings Since 1911
Largest Producers of Sealing Rings for Automatic Transmissions
and Power Steering Units

highlights

Watch for V-type diesels in trucks this fall. Detroit is now testing a line of V-4 and V-6 models for both truck and marine use.

Trends in Road Building will be the ARBA topic aired at the National Highway Conference for County Engineers and Officials. About 1000 are expected to attend the meeting in French Lick, Ind. on October 28-30.

Oil drilling rigs active in U. S. and western Canada totalled 2633 —just one less than a week ago. This compares with 2543 rigs in use a month ago as reported by Hughes Tool Co. to the American Association of Oilwell Drilling Contractors.

Air conditioning for more trucks is in the wind. Experience has proved it's not just a driver comfort. Cooling car fleets and trucks pays off in efficiency, alertness and fewer accidents. Look, too, for air conditioning in off-highway equipment. Same pay-off plus a way to beat heavy dust conditions.

Plymouth has delivered its 6000th locomotive. This milestone was reached when this division of Fate-Root-Heath shipped a 20-ton JDT Series diesel with torque converter drive to Anaconda Copper's Chile Exploration Company. The unit will haul matte slag at a sulphide plant in Chuquicamata, Chile.

Class I railroads installed 491 new locomotive units in the first four months of 1957, the Association of American Railroads reports. Of these, 487 were diesel-electrics and four were electric units. New locomotive units on order May 1 totaled 693, of which 663 were diesel-electric and 30 were gas turbine-electric units.

Coal can be mixed with oil and burned in diesels. That statement is made by research experts of the Denver & Rio Grande Western. Before the coal is added, it is pulverized and then split into tiny particles by atomic radiation. If it works in large scale tests, the new system could revitalize the coal industry with the fuel of the now-gone steam locomotives returning to help power modern diesels.

Mayflower II carried two diesels—just to be on the safe side. British-made, one engine powers the life boat and the other drives the generator for the ship's radio. Mobil diesel fuel, oil and grease stowed aboard lent another 20th Century touch to this otherwise authentic Pilgrim replica.

Alco made delivery of its 6500th locomotive to the N. Y. Central. That's the handsome total of Alco diesel and steam units bought by that railroad since 1900. The latest acquired is an 1800-hp, all-purpose DL-701 diesel-electric.

According to recent reports diesels are replacing steam locomotives even in such countries as England which must import diesel fuel, although they have a large domestic coal supply of their own. Australia has found that diesels costing $175,000 are saving $90,000 per engine year.

Highway contracts added up to $784 million awarded in the fiscal year just ended. These federal and state funds cover 1532 miles of roads. Another $213 million, ARBA reports, is being advertised but not yet awarded. Further, preliminary engineering and acquiring rights-of-way have been obligated to the tune of $732 million. This will mean a lot of additional contracts.

We've come to expect brains along with brawn in truck drivers these days. But don't do a double-take when you see beauty as well behind the wheel of a trailer truck. Betty Lou Mangum of Durham, N. C. is the first coed graduated from the truck driver course at North Carolina State College. Just dip your lights, boys, as you pass Betty Lou—her husband Bobby is the other half of this truck driving team.

"Evaporograph" is the new type camera being used for the first time in the steel industry. At U. S. Steel Fairless Works the camera serves a dual purpose. It makes temperature differences visible and permits temperature measurements to be made from the images produced. Sensitivity is such that differences of as little as 1°C (1.8°F) can be detected in the target temperatures. Developed by Baird-Atomic, Inc., this new instrument should prove a valuable tool in engine and gas turbine research.

Service Your Turbo—Keep It Trouble Free

Follow the manufacturer's recommendations in servicing turbochargers. Here's how the Elliot Co. says you should do it on their Models M-5 and M-10 — but the basic principles apply to turbochargers in general.

LET your turbocharger deteriorate and engine performance suffers. To maintain maximum engine efficiency and output the turbocharger must be in excellent condition. Follow the manufacturer's servicing recommendations and your turbo will be trouble free.

In general this applies to all turbochargers, but specifically let's see what the Elliot Co. has to say about inspection, maintenance and servicing of its M-5 and M-10 turbos used on various make diesels.

Impellers and diffusers must be kept clean for best turbocharger performance. Any build-up of dirt on the impeller will choke off air flow. Dirt can also cause a rotor unbalance leading to bearing failure. To prevent both mechanical failure and poor performance you must make periodic inspections.

The impeller and diffuser should be cleaned every 1000 hours or less depending on service conditions. To do this, disconnect the blower discharge piping and remove cap screws holding the blower casing to the intermediate casing. The blower casing must be pulled out along the rotational axis to avoid damaging the impeller shroud labyrinth seal rings.

The impeller, diffuser and blower casing should be cleaned with a suitable solvent to remove any dirt, grease or carbon deposits. Never use a caustic solution, wire brush or scraper on these parts.

The complete turbocharger should be cleaned and inspected every 3000 hours. This must not be attempted in the field unless the necessary special tools are available. These special tools can be obtained from Kent-Moore Organization, Inc.

The procedure for dismantling, cleaning, inspection and reassembly of the M-5 unit is as follows:

Dismantling Procedure

1. Remove unit from engine; attach rotor assembly lock and nozzle ring remover plate; and block with blower end up.

2. Check match marks on impeller (38), nose piece (39) and elastic stop nut (41). To maintain dynamic balance upon reassembly it is important that these pieces be reassembled in the same relationship to each other.

3. Place match marks on inlet casing (1), outer radiation shield (9), intermediate casing (14) and blower casing (28).

4. Remove blower casing to intermediate casing cap screws (29). Carefully remove casing (28) by pulling out slowly, along rotational axis to avoid damaging labyrinth seal rings on impeller.

5. Unlock lock strips (7) and remove nuts (6) from nozzle ring studs (5).

6. Remove elastic stop nut (41).

7. With turbine end up, use nozzle ring puller to remove nozzle ring (4).

8. With soft hammer tap blower end of shaft to loosen and pull off impeller (38) nose piece (39) and key (40) being careful not to damage threads, bend shaft or to cause expander wheel to hit against some foreign object.

9. Slide expander wheel and shaft assembly (36) free from bearings along axis of rotation. Remove inner radiation shield (11) and shims (3).

10. Remove inlet casing (1) from intermediate casing (14). Use tool as shown. Take off outer radiation shield.

11. At this point the first inspection of parts is performed. The oil seals (19) and (20) should be checked for (1) carbon build up in the labyrinths; (2) babbitt melted out from over heating or lack of cooling water; or (3) not being to the dimensions as listed in table (1). If any of these conditions exist, the seals are to be discarded. To remove the seals pass a brass drift bar thru the bearing bores from the turbine end and against the thrust collar (37) and tap thrust collar and seal (23) free. This same tool can be used on the turbine seal (19) by passing it through the cored oil drain passages and tapping the seal free.

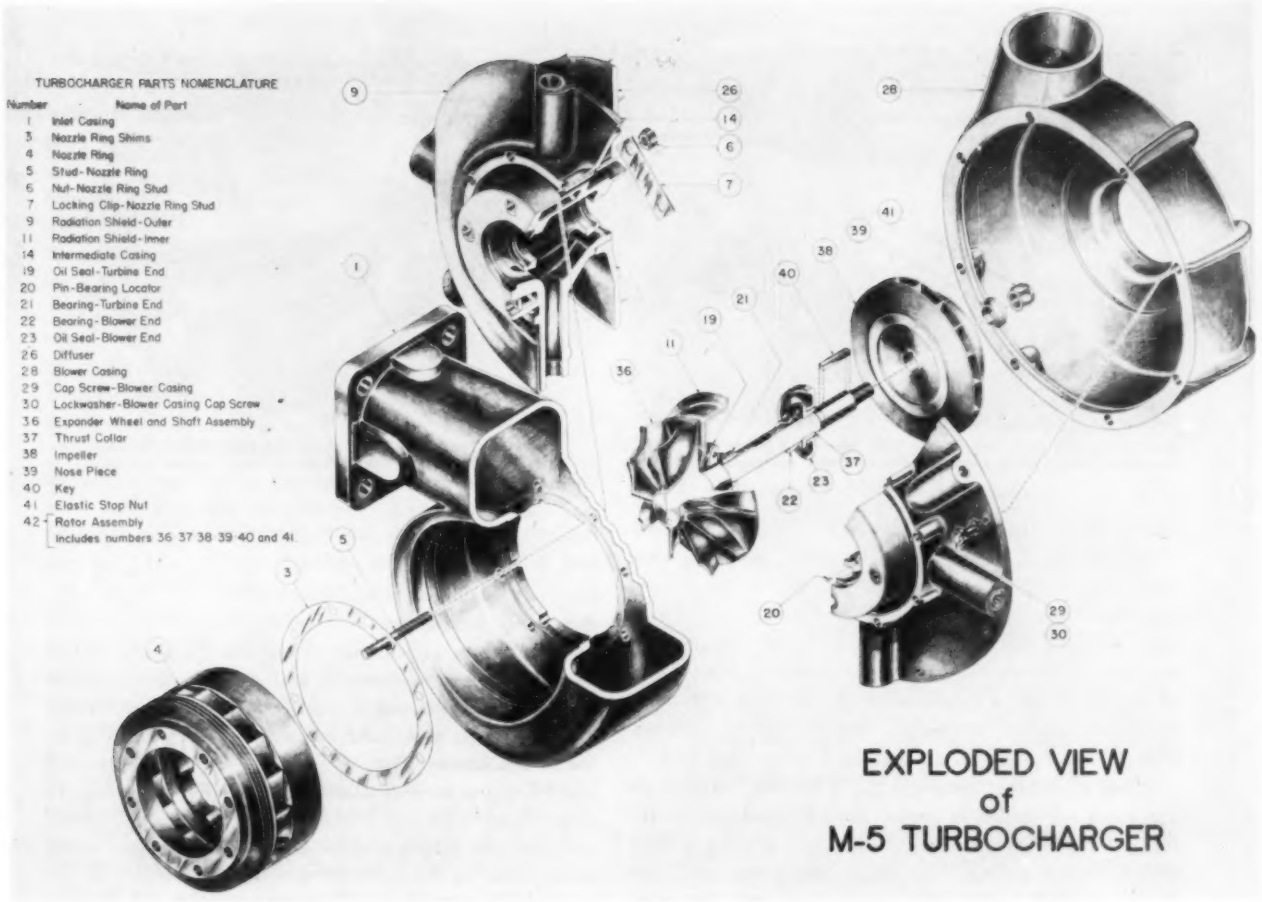
If the seals are salvagable, proceed as per the next step.

12. Scribe match marks on oil seals (19) and (23) and remove from intermediate casing (14) by use of brass bar as explained in step 11. This also removes thrust collar (37).

Cleaning

The component parts are now ready for cleaning and inspection. The diffuser (26), nozzle ring (4), and mating surfaces, should be cleaned with a good commercial solvent or kerosene. All deposits of grease, dirt, carbon and gasket compound must be removed.

The intermediate casing water jacket should be cleaned of any deposits, scale or sludge in the same manner used in cleaning engine water jackets. If an acid is used to remove scale, the water jacket should be thoroughly flushed out and the acid neutralized. Oil and air passages in the intermediate casing should be flushed and blown out thoroughly.



The expander wheel (36) and impeller (38) should be cleaned in Bendix cleaner or equal. Never use a caustic solution, wire brush or scraper on these parts. Rotor parts must be handled with care. Even slight damage to the expander wheel or impeller may cause serious damage to the rotor when reinstalled.

Inspection

Bearings and mating surfaces on the shaft are the only normal wearing parts of the machine. The bearings (21) and (22) must be inspected both for size and surface finish without removal, for once removed, they must never be reused. Bearings should be replaced if worn beyond the limits given in Table I, or if the surface shows pitting, corrosion or local wear. If the mating journal surfaces are scored, the finish should be improved by polishing with crocus cloth. Slight scoring of the thrust face is not objectionable if tolerances are within the limits given in Table I.

If bearings must be replaced from the intermediate casing use a bearing remover adapter as shown. This will prevent damage to the bearing housing bore. Merely compress the fingers of the tool through the bearing. The fingers then expand against the underside of the bearing and are held in place by tightening the wing nut. Using the slide hammer, tap the bearing from the assembly.

Normally the oil seals are subject to little wear, but the inside diameter should be checked while in place. The oil seal clearances should be within the limits given in Table I.

The expander wheel (36) and nozzle ring (4) should be inspected for mechanical condition. The blower impeller (38) should be checked for evidence of rubbing or mechanical wear and for condition of the labyrinth seal ring.

The nozzle ring should be examined for cracks and distortion or warping of the blades. This part of the unit is always subject to cyclic high temperatures and should be checked carefully.

At this point it is very important to check all rotating parts—especially the expander wheel (36) and the impeller (38) for any signs of cracks or rubs. If there is the slightest reason to suspect either of these pieces it should be discarded for with the high rotative speeds encountered, continued operation could prove dangerous. Also, if there is reason to suspect the balance of the rotor assembly, it should not be used. Because of the critical nature of the rotor balance, no substitution of parts is permitted on a rotor assembly without balancing the whole assembly and this is best done by the manufacturer under factory conditions.

Before assembly, all parts should be thoroughly clean-

Rotor assembly, lock, and nozzle ring remover is tapped with slide hammer at left. Bearing remover adapter is used with hammer at right.

Inlet casing puller is placed against intermediate casing. Puller screw forces bar against the inside of inlet casing.

ed and flushed and all the passages blown out with air.

When replacing bearings, the one with three restricted axial slots in the journal must be installed in the turbine end. The semi-circular slot on the OD of the bearing flange must line up with the locating pin in the intermediate casing before inserting the bearing. A feeler gauge should be used to check if the bearings are properly seated, for if they are not properly seated, they will reduce rotor end play.

When assembling bearings, use a bearing installer set and use a soft gasket to protect the babbitted face on the thrust flange. The bearing installer sets provide a positive means of getting the correct installation and press fit. The installer pilots the bearing true into the intermediate casing and prevents gouging the bearings on the edge of the internal oil passage. This could plug the oil passage with metal shavings causing turbocharger failure.

After the bearings are installed in the intermediate casing they must be line reamed with a bearing broach set. It's extremely important to have proper alignment of both bearing holes in the intermediate casing. These special tool sets provide the support to hold the bearing in the casing while broaching the babbit surface. This results in proper fit between the shaft and bearings. Pass the reamer through from the blower end toward the turbine end. Don't force the turbine end bearing from its seat in the intermediate casing.

Assembly Procedure

1. Install the blower end oil seat (23), tap around OD until the seal is fully seated and ream by using blower seal ream. Put on match marks and remove with brass drift pin. This seal must be removed after reaming to install the thrust collar (37). Install the turbine end oil seal (19) tap around the OD for locking and ream to proper size.

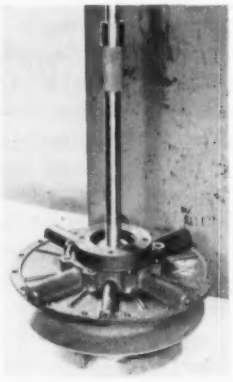
The newly installed seals must be reamed to insure proper size for the collar fit and for alignment with the bearings. Use turbine end and blower end seal reamers to do this quickly and efficiently, eliminating possible damage to the bearing babbit facing. The reamer has an automatic depth stop insuring proper reaming of the seals.

2. Place the thrust collar (37) against the blower end bearing (22) and install the blower end oil seal (23) lining up the match marks.

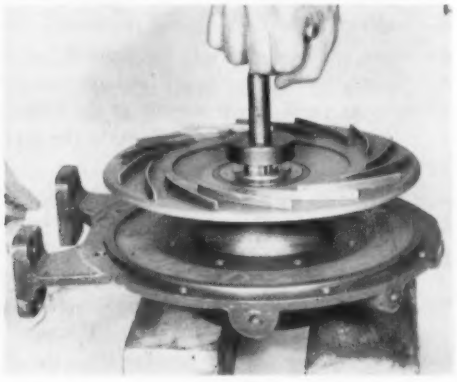
3. Block up the intermediate casing (14) with the diffuser (26) down. Place the outer radiation shield (9) in position and install the inlet casing (1), inlet casing cap screws and locking wire. This casing must be in correct relationship with the oil inlet connection.

Bearing installer set pilots bearing true into intermediate casing eliminating chance of damage.

Bearing broach set aligns bearing in casing while broaching.



Blower end seal reamer permits proper reaming and aligning of the end seal with blower bearings.



4. Install the inner radiation shield (11).

5. Coat the bearings and shaft with a light film of oil and slide the expander wheel and shaft assembly into position in the bearings. The sharp shoulder and knurled middle portion of the impeller shaft can easily gouge the bearing surface while installing. Therefore, use a special shaft pilot tool to protect the babbit lined bearings.

6. Install nozzle ring (4) and nozzle ring nuts (6) and lock-clips (7).

7. Check the axial and radial clearance over the expander wheel vanes. These clearances must be within the limits given in Table I and may be adjusted by the addition or removal of shims (3). These shims come in three sizes .005 in., .010 in. and .015 in. thick.

8. Place unit in upright position with the shaft horizontal, install key (40) in keyway back to thrust collar with mark facing up and towards end of shaft and slide impeller (38) on the shaft. Install nose piece (39) and elastic stop nut (41).

9. Tighten the elastic stop nut until the impeller is seated tightly against the thrust collar and match marks are in line. Block the expander wheel while tightening the elastic stop nut. Turn rotor by hand after tightening to determine if it rotates freely. Check rotor end play; it must be within the limits given in Table I. This can be done quickly and accurately by using a rotor shaft end play spacer. Used with a dial indicator, it provides a check of the rotor shaft end play prior to complete reassembly of the turbocharger. If an adjustment is necessary it can be made at this stage.

10. Install blower casing (28) in its correct relative position and install the blower casing cap screws (29) and lockwashers (30). While tightening screws, turn rotor at intervals by hand to check if it is free.

Check oil supply lines. They should be clean and fittings in good condition. If the oil filter element is not in first class condition it should be replaced.

With reasonable care and sticking to good shop practice, you should have no trouble dismantling and assembling the turbocharger. Check the air inlet equipment. It should be clean and tight to prevent entry of foreign particles.

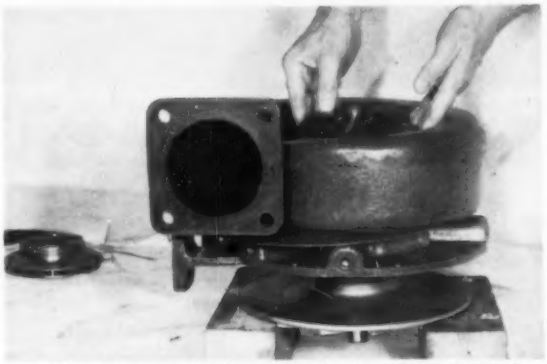
General Maintenance Comments

If the machine is to be shut down for an extended period, the turbocharger must be dismantled and the shaft and bearing surfaces thoroughly covered with vaseline. All exposed surfaces should be slushed with rust preventive compound. Before placing the unit in operation again it must be dismantled to thoroughly clean and remove this protective coating.

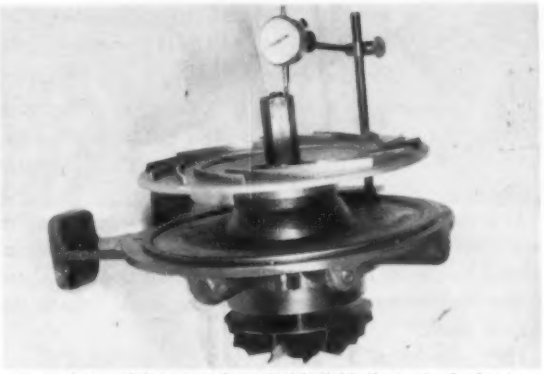
The Elliot turbocharger is designed and constructed to eliminate hand fitting of moving parts. All repair parts should be entirely interchangeable without forcing or fitting. In assembly and repair, parts must be handled carefully and kept clean since tolerances on some parts are such that nicks, burrs or dirt will interfere with proper operation.

Table I

Clearances In Inches	M-10	M-5
1. Rotor end play, with surface oiled ..	0.004-0.013	0.004-0.012
2. Journal bearings—		
Shaft diameter OD	1.1230-1.1235	0.9365-0.9370
Bearing diameter ID	1.1253-1.1255	0.9380-0.9382
3. Labyrinth Ring—		
Clearance on diameter over impeller	0.024-0.032	0.020-0.024
4. Expander Wheel Vane Clearance—		
Radial	0.025-0.045	0.025-0.040
Axial	0.022-0.051	0.022-0.050
5. Oil Seals—		
Clearance on diameter over shaft:		
Blower End	0.003-0.005	0.003-0.005
Turbine End	0.003-0.005	0.003-0.005



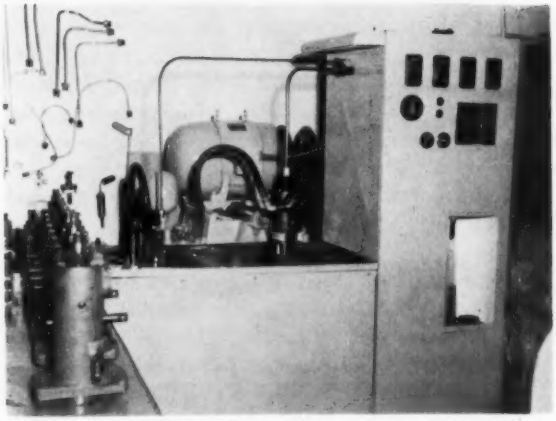
Shaft pilot protects babbit-lined bearing from being damaged by sharp shoulder and knurled middle portion of impeller shaft.



Rotor shaft endplay spacer is used with dial indicator to check rotor shaft endplay prior to complete reassembly of turbocharger.

Dial indicator is used to check shaft endplay after turbo is assembled. It's also used to check concentricity of bell housing.

"Nozzle testing and adjustment checks quality of earlier work. We have all the testers (1) for a wide range of nozzles and also unit injectors. One is motor-driven to 'run-in' and check performance under conditions similar to those in the engine."



"Visual inspection of big-pump parts can fool you. That's why we built this test stand (2). Also, without it, you have to hope that your work restores calibration. With it, we know. We find less parts are discarded and customers get a break."

Talking Shops.....

Diesel Fuel Injection Service, Inc. in St. Louis is a good study in efficient space utilization. Arrangement of its comprehensive tooling and general orderliness are keys to getting a lot of work through this compact shop with a minimum of lost motion.

IN St. Louis diesel circles, as for "Diesel Fuel Injection Service, Inc." and you'll probably get a blank stare. But ask for "Red" Ottenad's shop and it's a different story. So it's Red's shop from now on.

At first glance you get several distinct impressions. It's very clean, extremely orderly, and painted in cheerful colors. You soon appreciate the air conditioning. There is also the feeling that in view of the work volume the shop is small.

Then you realize . . . but let's get it from Red.

"How about it, Red? Your shop seems small."

"Depends on how you look at it. Don't forget there is a lot of equipment here. I'd call it 'efficiently compact'. A lot of thought went into its layout. I wouldn't want too big a shop; we make money working, not walking.

"Speaking of walking—and standing too—notice this wood-block floor. Easier on your feet than concrete and you don't need catboards. Easy to keep clean too."

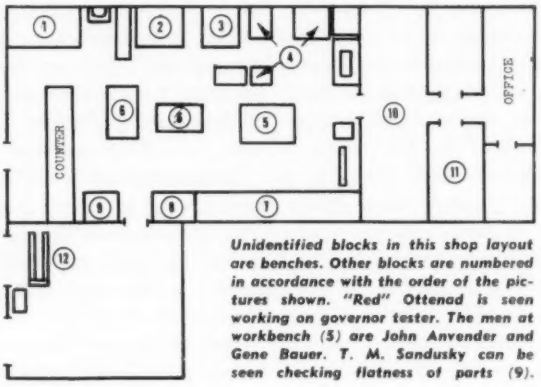
"Now let's talk about your machines."

"Come on, I'll show you around first."

(*Pictures show "Grand Tour", captions, Red's comments.*)

"What's your thinking on all this equipment?"

"Couldn't do without it. Machines improve work quality and cut costs. Customers welcome both benefits.

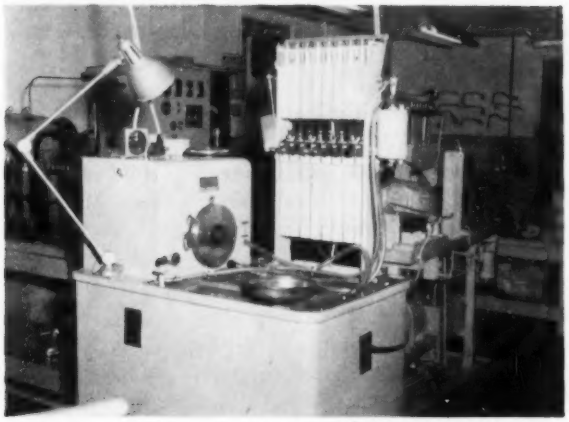


Unidentified blocks in this shop layout are benches. Other blocks are numbered in accordance with the order of the pictures shown. "Red" Ottenad is seen working on governor tester. The men at workbench (5) are John Anvender and Gene Bauer. T. M. Sandusky can be seen checking flatness of parts (9).

"Flat lapping by machine (9) saves time. Hand-lapping is cut to a minimum. Fixture on plate is bearing outer race with drilled, pressed-in plate to hold parts. Flatness is checked by light bands in optical flats."

"Governors are checked and adjustments made on the test stand (3). The governor controls its drive just as it would on the engine. You set it up to get proper response and see that you get it."

"Cleaning is a big part of this business. There's not only dirt but varnish, lacquer and carbons. We have three covered tanks (4), made here in the shop. Cold solution is either agitated or the parts trays oscillated. There's also a "deep sink" wash table."

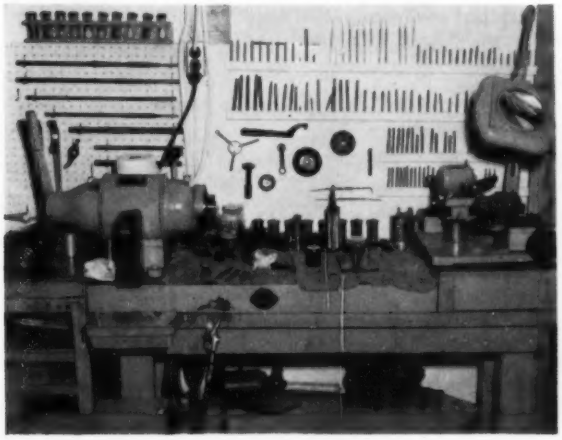


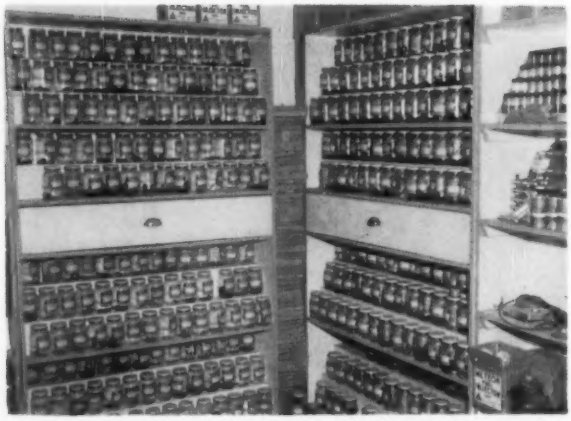
"Two calibrating stands with the different adapters and fixtures (6) test all of the multi-plunger and distributor-type pumps. We have all the specs to set them up right before they go out. Then we hope that they are properly installed."

"A low bench is centered in this work area (5). Units put in the vises come up to mid-chest level, convenient for heavy torquing jobs. It's only a few steps to cleaning tanks, test equipment or the drill press and lathe on the back wall."

"Nozzle seats are lapped with cast iron or stone-tipped arbors. We converted the lapping head (8) for 2-speed operation to suit each. Seats are checked with the otoscope. Needle faces are reground on the grinder and checked with the big magnifier."

"There's a standard-height bench (7) for other work. Tools are well displayed for convenience and there's storage for common parts and materials underneath. That messed-up pump is one of those that is used for foam rubber injection."





"We stock enough parts (more than should be required) to carry us through the time between ordering and getting them (10). The 'supply line' is often pretty slow and our customers want real service. We're getting up against it for space. The bottles work fine but we're replacing them with cabinets; they take up too much space."

"Take cleaning; it's one of our biggest jobs. We built up three tanks so that we can concurrently clean different parts, with different deposits having different removal times. We piped compressed air around the shop and with diesel fuel or solvent, secondary cleaning is done at the work. Cleaner parts in less time.

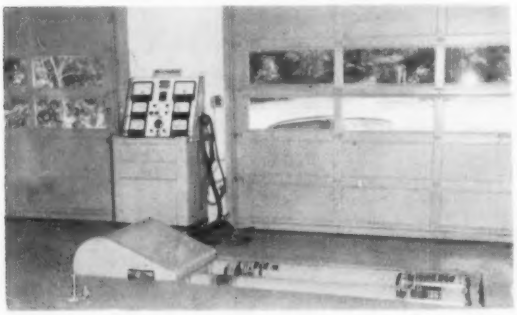
"Look at the nozzle bench. There's hand and power tools for a fast, top-flight job. For flat lapping, we load several parts at once on the machine, set the timer and soon the job is done—and parts are flat. Again, a better job in less time.

"Then with test equipment we get a final check on job quality, calibrate accurately and adjust. All this cuts comebacks, costly to customers as well as to us. Another thing, testers save a lot of parts for the customers. Visual inspection can fool you. Without testers, you can't take a chance with so-so parts; you replace them. But if they meet specs on the tester, they stay."

"What's in the back of the shop?"

"Our stock room, a place for final processing and packing, and an office. The parts room is going to be changed. We can use the space more efficiently. The glass jars look neat and you can see the parts but they waste space. Metal cabinets with different-sized compartments will give more storage in less space. We plan a locater system based on parts numbers."

"This chassis dynamometer (12) was installed, looking ahead to fuel injection in cars. We handle the Saaty Meteor units now. It's coming and we'll be ready to do a real job."



"What about packing and processing?"

"It's done for protection for repaired equipment. We use these Caplug plastic enclosure seals to close all openings to dirt. They keep items internally clean. Then we use standard cartons and wrapping materials.

"We also do some of this hot plastic dipping that gives a complete coating for long-term protection. Here's an idea for your readers. We rigged up a standard deep-fat fryer to heat the plastic. Works fine.

"We've used one wall of this room for a gasket board. Hanging them on the board keeps them flat and in good condition. The're easy to select too."

"What's in the new wing?"

"That's the 'looking ahead' department. I built it and put in a chassis dynamometer in anticipation of fuel injection in cars. When it comes, we're ready to undertake the work and test the results."

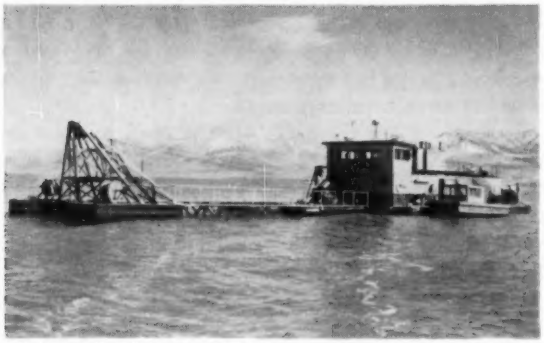
"Any special stuff that you're doing?"

"Well, I'm working with Roy Larson of St. Louis Ships. We do injection work for them. They are running some towboats on residual fuel and on the Vapor Phase (high-temperature cooling) system. Actually, though, the injectors are no worse than those running on diesel fuel. Also, they're running some GM 258 4-cycle engines. We worked out a simple conversion so that we can rebuild the injectors, using mostly current-production parts.

"Here's another interesting one. A local foam rubber company uses regular fuel injection equipment to meter and mix the materials. The metered materials mix in the nozzles and are injected into a long moving mold where a reaction then takes place. It's good business; cleaning and calibration is frequent."

Lake RR Bed Construction Depends On Diesels

Diesel-powered equipment of all types is being used for building the 13-mile Southern Pacific Railway causeway across the Great Salt Lake.



Portable dredge "Hood" with 15-in. pump moves average 15,000 cu yd of lake bottom daily. Five 6-cyl, 149-hp Detroit Diesels power pump. Two 150-kw units power cutter head and winding gear.

One of 15 Euclid rear-dump trucks powered by 300-hp Detroit Diesel unloads rock over side of fillway. Trucks were moving fill at the rate of 30,000 cu yd per 16-hr day from the quarry.

One of six bottom-dumping barges is moved from loading dock. Hydraulic dumping mechanisms are activated by 2-cyl Detroit Diesels.

CONSTRUCTION of a 13-mile railroad bed across Great Salt Lake depends on diesel-powered equipment worth millions. The new causeway will be used by the Southern Pacific Railway.

The project was started in March, 1956, and should be completed by 1960. It calls for bridging the lake with a solid fill, 13 miles long and 38-ft wide at the top for double tracks. It will replace a 53-year old wooden trestle that bridged the lake on Southern Pacific's mainline route between Ogden, Utah and points west.

Work is underway in two stages and involves 16 million yards of dredging and placing 33 million yards of fill. Project cost under contract to Morrison Knudsen of Boise, Idaho, is estimated at $45 million. Railroad track and signal equipment will cost another $4 million.

As the causeway is pushed west, the proposed route is first dredged to form a sound foundation on the lake bottom. Soft mud is removed down to salt layers and hard clay to form a channel on the lake bottom about 35 ft deep and 175 to 480 ft wide, depending upon water depth.

Two dredges do this, each equipped with cutter heads and 15-in. suction pumps powered by GM Detroit Diesel 6-110 generator sets, a 6-71 power unit and a Quad 6-71 power unit. Each dredge works round the clock moving an average 15,000 cu yd of lake bottom material per day.

As dredging is completed, gravel and quarry-run rock for lower layers of the fill is moved from shore to the channel by six 2000-yd capacity barges pushed by tugs. A Detroit Diesel 2-71 generator set supplies power for the electric-hydraulic steering on the tug. Barges are bottom-dumping type units. Each has a GM 2-71 Delco Y-562, 20-kw generator set for hydraulic dumping controls and lights. They are loaded on shore by a $1,700,000, 2½ mile-long conveyor belt carrying fill from the quarry to a loading dock on the lake.

The rock crusher and belt conveyor system is supplied by 11 Euclid 25-cu yd trucks. These are powered by GM 6-110's. With an average haul of 750 ft one way they carry 21,000 cu yd during an 8-hr shift.

When the fill reaches a level 10 ft below the lake surface, the barging operation is discontinued. Dump trucks working out from the shore then move in to dump the remainder of the fill. When completed, the fill is to be 18 ft above the lake surface. Fifteen Euclid 17-cu yd capacity trucks haul rock fill material from two quarries to the new causeway. On a 2½-mile, one-way haul these units powered by GM 6-110's engines produce 15,000 cu yd of rock per 8-hour shift. They work two 8-hr shifts per day, 6 days per week.

At deep points along the route, the base of the fill will reach a 70-ft depth below the lake surface. Fill requirements for the entire project include 19-million cu yd of gravel, 12 million yd of quarry-run rock and one million yd of select rock for rip-rap.

Completion of the new roadbed will bring to an end the cost of heavy maintenance borne by the railroad in keeping the old trestle in repair.

Type of service, ambient temperature, altitude and other factors will influence the quality of fuel that should be used for best results. Follow the engine manufacturer's specs but don't use a better quality fuel than necessary. Here are some comments on one type of service showing how you can . . . . .

Cut Fuel Costs For Earthmover Engines

By R. G. Johnson, Fuels Consultant, Caterpillar Tractor Co.

FEW of the diesels used in earthmoving equipment need No. 1 diesel fuel. The others operate no more efficiently, develop no less horsepower per fuel dollar and have no longer life than they would burning less expensive, heavier fuels.

Since most contractors are paying at least two cents per gallon more for premium fuels, up to $49 a week can be saved easily on medium-sized road jobs by using heavier fuels. Up to another two cents per gallon can be saved by buying fuel in larger quantities.

If such savings are possible, why do so many contractors use the more expensive fuel? The answer is that they do not understand fuel requirements of their engines, they do not know what fuels on the market satisfy their needs, and even some suppliers do not know which of their fuels will do the job best and at the least expense.

Fuel Requirements

Fuel requirements for an engine can be obtained from an engine manufacturer's specification sheets. Learning what fuels are available which meet the requirements can most easily be handled by showing these specifications to the local supplier. He can then match what he has available to the requirements.

No. 2 furnace oil is generally available in most sections of the country. It is widely used in homes and industry for heating, cooking and power. Why, then, is it not used in diesels powering earthmoving machines?

Usually when a supply of diesel fuel is ordered for these engines, No. 1 diesel fuel is automatically furnished. But this is better than these engines need. The cetane number is substantially higher than required. The distillation end point is lower than necessary for good operation. Other specifications such as viscosity, pour point and carbon residue are lower than necessary while gravity is normally too high. These fuels are for use in certain types of engines and for demanding services. Usually the earthmoving equipment engines can burn heavier fuels.

Chart I gives a resume of ASTM ratings (based upon manufacturers fuel specifications). The two left hand columns prepared by ASTM contain a list of factors which are intended to serve as guide posts for typing or classifying No. 1 and No. 2 diesel fuels. The remaining columns are typical diesel fuels now marketed.

Note the relationship between the ASTM fuel specifications (columns 1 and 2) and the fuels currently available (columns 5 and 6). Cetane ratings of the current fuels have been sharply upgraded. For example, the cetane number for No. 1 diesel fuel is about 50% and for No. 2, about 25% higher than corresponding ASTM recommendations.

It also presents a peculiar situation where the current No. 2 diesel fuel exceeds specified volatility for ASTM rated No. 1 diesel fuel. Economically or performance wise this practice is not necessary for meeting the requirements of most diesel engines.

Here are a few comments with relation to these important fuel tests which show why higher grade more expensive fuels are not always necessary, particularly for the engines used in heavy construction equipment.

Cetane: This is a measure of the ignition quality of a fuel. Usually for colder climes a higher cetane rating is desirable. Cetane only helps starting—it does not provide more horsepower.

Sulphur: This will burn as readily as the other fuel properties such as carbon or hydrogen. However, it forms sulfur dioxide, trioxide or both, which may form corrosive products. For this reason a limit of 1% maximum is usually set. Since the advent of Series II or III high detergent lube oils, sulfur content is not as critical as it used to be.

Gravity: This measurement is an index of the weight of a measured volume of fuel. Lower API (American Petroleum Institute) ratings indicate heavier fuels which contain more heat value per gallon producing more work per gallon of fuel.

Viscosity: This factor is a time measure of resistance of a fuel to flow. Some low viscosity fuels do not possess good lubrication qualities. Too high viscosity makes for poor fuel atomization decreasing combustion efficiency. High-speed and medium-speed diesel engine fuels are usually in a range of 33-45 Saybolt seconds at 100°F or 2.1-5.8 centistrokes.

Pour Point: This denotes the lowest temperature at which fuel will flow or pour. Generally it should be ten points lower than the operating temperature. However, pour point does not limit use of a fuel in temperatures lower than the pour point if heat can be applied.

BS&W or Water and Sediment: This denotes fuel cleanliness. No more than a trace should be present. In practically all cases refineries put out a product which is clean. Most of the water and sediment which enters thereafter is caused by improper handling and condensation.

Carbon Residue: This factor is a measure of how completely a fuel will burn. It indicates the amount of carbon that may be deposited in the combustion chamber. Precombustion chamber-type combustion systems are less sensitive to this characteristic.

CHART I

Comparison of ASTM Diesel-Fuel Specifications to Typical Diesel Fuels Currently Marketed

	ASTM diesel fuel spec.		Kerosene (often used as No. 1 diesel fuel)	Typical fuel specifications*			
	No. 1	No. 2		No. 2 fuel oil	No. 1 diesel	No. 2 diesel	Marine diesel
Cetane number, min.	40	40	60	34-45	55-60	48-50	35-40
Sulfur content, max. (%)	0.50	1.0	0.15	0.2-0.7	0.01-0.5	0.01-0.75	1.0
Gravity, API at 60°F	—	—	43-36	34	36-40	34-39	32
SUs viscosity at 100°F	—	32-45	33	34	34-38	35	30-40
Flash point, °F	100	125	115-135	150	140-170	150	150
Pour point, °F	(+)	(+)	Varies	—5	0-10	0-10	0
Water and Sed. % max.	Trace	0.10	0.10	—	0.05	0-10	0.10
Carbon residue, 10% bot. max.	0.15	0.35	—	0.10	0.05	Trace	0.35
Ash, %	0.01	0.02	Nil	0.02	0.02	0.10	0.02
Copper strip-corrosion	No. 3	No. 3	—	Neg.	Neg.	Pass	Pass

*These averages were compiled from information received from a number of the major oil companies.
+For cold-weather operation the pour point would be specified 10°F below the ambient temperature at which the engine is to be operated except where fuel-oil heating facilities are provided.

Ash: This is a measure of incombustible foreign material in fuel. Practically all of this matter is abrasive. Fuels for Caterpillar engines should not have a rating of more than 0.02 ash content.

Corrosion: This is a measure of corrosive material in the fuel prior to combustion and affects fuel pumps and injectors. Corrosion of ASTM #3 or less is desirable in fuels used in Cat diesels.

In a survey of 51 diesel engine manufacturer's fuel specifications, the following results were obtained. Forty-four of the 51 manufacturers can use a fuel with a cetane rating of 45 or lower. Only seven require a higher cetane fuel. This indicates that current fuels have unnecessarily high cetane ratings to meet the requirements of the minority.

Another factor important to the user of earthmoving equipment is the *distillation or evaporation* specification. This determines gravity of the fuel. A broader distillation range indicates a lower gravity fuel with high heat content per gallon, or, in other words, how much horsepower is contained in a specific gallon of fuel. A gallon of No. 2 fuel contains from 2500 to 5000 more Btu than a gallon of No. 1.

Thirty-eight of the 51 manufacturers surveyed can use a fuel with an end point of 675°F or more. Only 13 need a fuel with an end point lower than 675°F.

Savings with Heavier Fuels

The following example illustrates the advantage of using a fuel with a lower cetane, more Btu and higher distillation range. The relationship applies to any diesel engine.

Assuming we have a 210 hp engine at 1800 rpm, using 0.5 lb of fuel per hp/hr, this engine will use 105 lb of fuel in one hour. Using No. 1 fuel weighing 6.95 lb/gal, 15.10 gal/hr will be used (105÷ 6.95). Operating 8-hr a day, 122.8 gal will be used (8x15.10). With No. 1 fuel at 16 cents per gal, the cost for 8 hours will be $19.33.

When comparing with No. 2 furnace oil, the same engine using the same fuel consumption of 0.5 lb/hp/hr, with fuel weighing 7.11 lb/gal, will use 14.76 gal/hr. In an 8-hr day, 118.08 gal will be used. At a cost of 14 cents per gal for No. 2 fuel, the cost per 8-hr day will be $16.53. This gives a saving of $2.80 every 8-hr day over the No. 1 fuel ($19.33 - $16.53). For a 2400-hr year, $840 will be saved.

OPERATING COSTS COMPARISON OF DISTILLATE FUEL BASED ON 0.5 lb FUEL Hp/Hr

Grade	Average Lb/Gal	Hp/Hr/ Gal	Price Gal (Average)	Gal/Hr/ 100 Hp	Cost/Hr/ 100 Hp	Savings/hr/ 100 Hp (in cents) Ker. v/s	1D v/s	2D v/s
Kerosene	6.91	13.82	0.18	7.24	$1.30	—	—	—
No. 1 Diesel Fuel	6.95	13.90	0.16	7.19	$1.15	15	—	—
No. 2 Diesel Fuel	6.99	13.98	0.15	7.15	$1.07	23	8	—
No. 2 Furnace Oil	7.11	14.25	0.14	7.03	$0.98	32	17	9

This proves it is definitely advantageous for a consumer to order as heavy and clean a fuel as his diesel engine and temperature conditions permit. Fuel costs represent as much as 80% of total operating costs for a diesel engine stationary installation. For dieselized tractors, etc., this percentage will be less because other factors are included in operating costs. But it is still a great enough incentive as a method of reducing costs. It is just good economics to look closely at the largest cost first.

Conclusion

It is apparent that heavier and reduced cetane fuels are advantageous. They do a better job and they do it at lower cost. The question is, how do you acquire them?

Like everyone else, the supplier will stock what he has a market for. He already has a market for these heavier fuels as furnace oil. The storage and marketing facilities are already established. So all the contractor has to do to help ease the cost squeeze and realize these savings, is to request these heavier fuels, like No. 2 furnace oil, when he buys fuel for his engines.

Reconditioning Crankshafts

By James H. Kannen—National Forge and Ordnance Co.

Reclaiming crankshafts successfully by chrome plating depends on how precisely each step of the process is carried out before, during and after the actual plating. Here are the techniques used by the National Forge Co. to solve the many difficult problems involved.

THERE is more to reconditioning crankshafts than meets the eye. Producing the original crankshaft is a complicated and exacting job. So is reconditioning. Some processes are similar—but reconditioning introduces many new problems—and techniques to solve them. I know because my company has been solving these manufacturing and reconditioning problems and gaining the necessary knowhow through years of research and experience.

History and Background

Since 1914, the National Forge and Ordnance Co. has been producing commercial forgings to its customers' specifications. For over 40 years, large diesel crankshafts have been carefully produced from our own electric melting furnaces, forged in our own forge shop and finish-machined by our completely equipped machine shop.

Where required, we have nitride hardened or chromium plated National Forge produced crankshafts in our own facilities. And at every step of this complex manufacturing process, National Forge specialists have carefully inspected crankshafts and controlled their quality and dimensions within strict tolerances.

About ten years ago, our company realized that with most railroads operating large fleets of diesel locomotives, reconditioning of their crankshafts would eventually be a major problem. We studied various types of diesel crankshaft reconditioning and surveyed most of the major roads of the country regarding their experience with them. We discarded many methods then in use as unsatisfactory.

Railroads were finding that the use of various undersized crankshafts resulted in an extreme number of offsize bearing shells in their inventory. The resulting confusion occasionally found maintenance personnel putting an incorrect bearing shell on an undersized crankshaft. It was obvious that to minimize the number of bearing shells required, a reconditioned crankshaft should be brought up either to full size or to a standard undersize which would be acceptable.

Our experience in forging and machining crankshafts and our investigations led us to believe that chromium plating was the most satisfactory solution. While the chromium plate is, in effect, a mechanical bond, the bond can be much closer than any other type of bonding if the base surface has been prepared properly before plating.

In addition, chromium plate gives a very hard, durable wearing surface on pin and main journals. Further, chromium plate can be applied to a surface to any reasonable thickness varying from approximately 0.005-in. to more than 0.125-in. with very little risk to crankshaft operation.

Although we had chromium plating facilities for about 15 years, our technical personnel realized that reconditioning of crankshafts posed other problems. These were different to any we had previously encountered in applying hard chromium plate to wearing surfaces, either for wear-ability or sizing undersized parts.

For this reason, our technical specialists began the study of various methods of applying chromium plate. They built anodes and used various chromium plating solutions and temperatures to develop a chromium plating satisfactory for the severe use in diesel crankshafts.

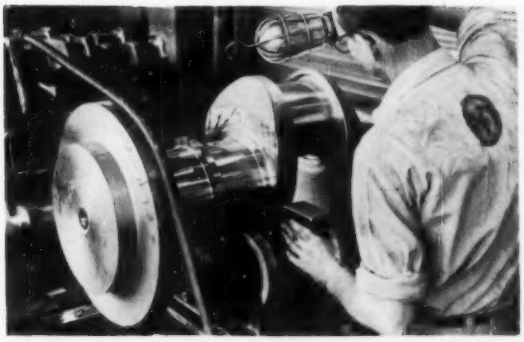
After approximately five years of such research it was possible for us to solicit the reconditioning of diesel crankshafts on a limited basis. Then we field tested reconditioned chromium plated crankshafts in service for one and a half years. Results of these field tests made us confident of our product and we now solicit this type of business from all sources.

Reconditioning Department Inspection

Crankshafts are received at our plant from many users of diesel engines, both locomotives and other large diesel power units. The first step after receiving the crankshaft is a complete examination of it for surface defects such as heat checks, scoring, cracks, etc. This is done by the use of Magnaglo.

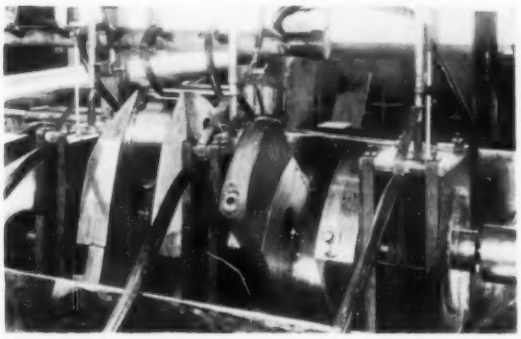
If examination by this magnetic-particle method does not show any defects which warrant rejection of the crankshaft, it is then given a complete dimensional inspection. This inspection includes measurement and charting of all journal sizes, gear fits, runout of journals, flange faces and pilots, as well as determination of angularity and parallelism of pin journals. Both the magnetic-particle inspection and the dimensional inspection are charted and these charts are examined by our experienced specialists.

If the shaft is within the normal limits for reconditioning, work is started on it immediately. However, if there are some unusual defects, our customer is immedi-

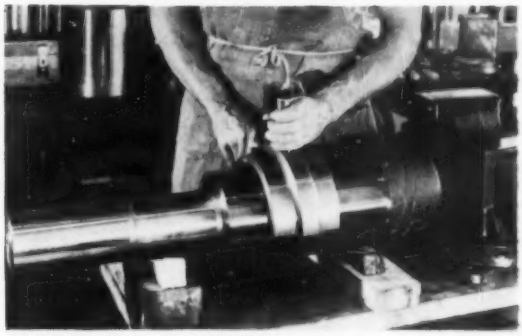


A Magnaflux inspection of the crankshaft is being made here, but Magnaglo is used for more critical inspection operations.

Dimensional inspection is made of all the worn crankshaft surfaces including bearing fits, angularity, parallelism, etc.

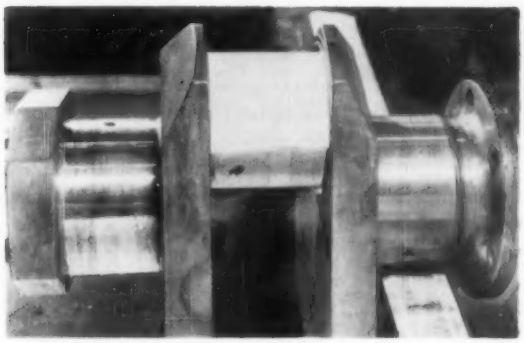


Plating boxes containing anodes are shown around main journals. These boxes insulate the fillet areas from the plating action.

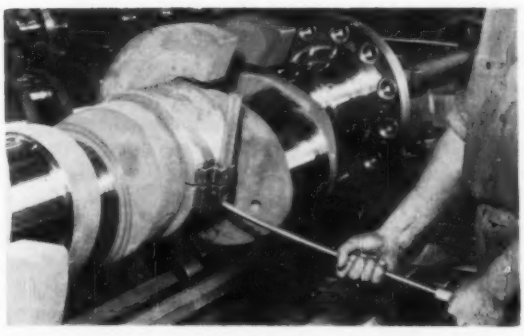


Blue box is checked against master gauge. Blue boxes are used to check bearing surfaces of all crankshafts at National Forge.

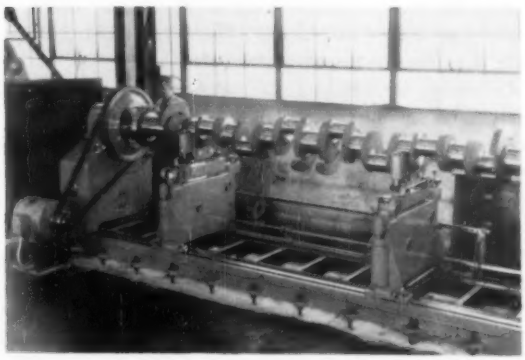
A compressor crankshaft is being ground in a crankshaft grinder after plating. Many are reconditioned at National Forge.



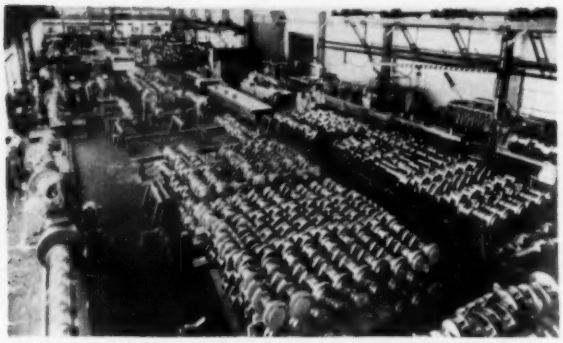
Penetrating dye is put on crankpin and covered with chalk-like substance. Dye seeps through if there is any defect on surface.



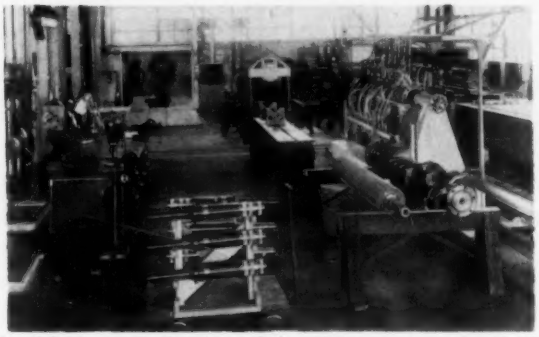
Rigid lapping device developed by National Forge prevents eccentricity and maintains parallelism while polishing surfaces.



Here is the dynamic balancing machine used in balancing every new and reconditioned crankshaft before it leaves the shop.



New crankshafts are seen in process in crankshaft department of National Forge. Special machinery lines all the walls of shop.



At right rear of chromium plating dept. is seen one of the specially made chromium plating machines used at National Forge.

ately notified so that he may review the condition of the shaft and advise whether we should proceed.

Straightening After Initial Inspection

If the crankshaft is salvageable it is straightened by a method of peaning developed at National Forge primarily for this purpose. This type of peaning is done in areas of the crankshaft which are not critical or subject to critical stresses. Actually, no such straightening action is taken on bearing surfaces, fillets, or thrust collars.

Grinding

Once the crankshaft is straightened to acceptable tolerances it is taken to the grinding department. Here it is ground very carefully to remove defects on the journal surfaces and to correct dimensional irregularities. This grinding follows a definite prescribed pattern which in our opinion is the most satisfactory preparation for the application of chromium plating.

Throughout the grinding operation, visual and magnetic-particle inspections are frequently made to insure complete removal of surface checks, cracks, or defects. Special care is taken to grind the shaft to permit a uniform build-up in the plate and to eliminate areas of stress concentration.

Plating

After proper preparation by grinding, the crankshaft is sent to our chromium plating department where the surface is cleaned chemically. Then it is blasted to prepare it to receive the chromium plate.

Following the blasting and preparation of the crankshaft, it is set up for chromium plating by our special process. Each main journal and pin journal is plated separately. The accompanying photo shows the plating operation. Note that each bearing surface is individually boxed and individually plated.

This approach to chromium plating has several, benefits.

1. Plating action is kept away from all fillet areas to minimize the hydrogen embrittlement effect to this highly stressed portion of the crankshaft.

2. It is possible to chromium plate any one, or group of mains and journals without exposing those not requiring plating to the action of chromic acid or electrolytic action.

3. It is possible to build up different thicknesses on the same crank simultaneously.

4. All of the chromium plating solution can be filtered immediately prior to its being exposed to the area to be plated. This eliminates magnetic particles and small bits of dirt which may get into the solution.

Plating applied in this way is uniform in thickness and very smooth on the surface. Our method permits us to plate up to full size with a maximum of about 0.00025-in. deviation in the plating thickness from one side of the journal to the other. In addition, we eliminate almost all the nodulation usually found in heavier plates.

In one operation we have applied as much as 0.250-in. to the diameter of a bearing surface. While our experience does not, at this time, indicate the value of such heavy plating, we have now in service several crankshafts with 1/8 or more inches on the surface. These crankshafts, as well as special tests now in process, may prove that plate thicknesses heretofore believed to be too heavy for durability are actually practical.

Grinding

After the crankshaft has been released by the chromium plating department it is returned again to the grinding department. Here the journal surfaces are ground and polished to the original tolerances of the engine manufacturer, or to a standard undersize.

Chromium plate must be ground extremely carefully and slowly to avoid development of grinding cracks in its surface. These surface cracks are believed to be very detrimental to its service life.

It is in this grinding that uniform application of chromium plate becomes very important. If it has been applied too heavily on one side of the pin or main journal, it is necessary to remove more stock from that side than from other areas of plate surrounding the journal. Naturally, it is necessary to grind more heavily on the side with the heavier deposit of plate. This may cause surface checking and grinding checks to develop in the plating itself.

Grinding of crankshafts is done in a precise crankshaft grinder which not only maintains the proper journal dimensions and roundness, but also allows for truing up angularity, parallelism, etc.

Polishing

Following grinding, the crankshaft is polished on those areas which have been plated and ground. During polishing, frequent inspections are made by using blue boxes to insure that journal surfaces provide sufficient bearing areas. A standard bearing surface with a minimum of 85% blue box fit is maintained. To maintain these bearing fits it is necessary to use a large supply of blue boxes. These are checked daily against master gauges to assure complete accuracy.

The crankshaft is polished in special fixtures which cover the entire bearing surface with a solid-metal lapping tool developed specifically for this purpose. This tool minimizes any possibility of distortion of the crankshaft journals by change of angularity, producing egg-shaped journals, or other deviations.

While there is some industry disagreement with respect to the definite micro-inch finishes required on such journal surfaces, the technical specialists at National Forge have set a standard of surface roughness of not more than 10 micro-inches. And it is to this standard that we work.

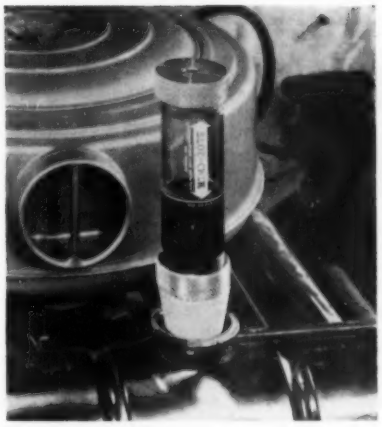
More Inspection

On completion of grinding and polishing, the plated areas are examined by a dye test in which the entire surface is covered with a highly penetrating stain. The surface is then wiped clean, and a chalk-like substance is applied. Any defects in the plate will retain small quantities of the dye. This will seep through the chalk-like material and show up immediately. No chromium plated job is permitted to leave National Forge unless it can pass this test.

Dynamic Balancing

After the chromium plate and polishing has been approved by our specialists, the crankshaft is checked for dynamic balance. This is done on a new type of balancing machine made by the American-Trebel Co. It is specially designed and equipped so that balancing may be done not only from the planes at either end of the crankshaft but also at any plane throughout the full length of the shaft. This is a relatively new approach to the balancing of crankshafts and the National Forge and Ordnance Co. feels that it gives a much more accurate and closely balanced crank.

Final inspection of the crankshaft is made by our regular crankshaft inspectors. They are specifically trained for this work and are completely familiar with the requirements of new crankshafts for original equipment. Dimensions of the rebuilt crankshaft are charted. On completion of this final inspection, this chart is forwarded to our customers for future reference and use.



Internal Combustion Leaks Located From Outside

PINPOINTING leakage of combustion gases into the cooling system is difficult. With present methods, even if a mechanic knows there is a combustion leak he has no way to positively determine which cylinder is at fault without disassembling the engine. Considerable time and expense in engine diagnosis and repair would be saved if such a leak could be quickly determined and located in the early stages thus preventing damage due to loss of coolant and overheating.

An instrument just introduced by the P & G Mfg. Co. is said to be able to show in one minute's time whether or not an internal combustion leak is present. This instrument, the "Bloc Chek", can do this regardless of whether the leak is caused by a faulty gasket, a cracked or warped cylinder head, or a cracked block. In addition, it permits the mechanic to quickly determine the cylinder or cylinders where the leak is occuring.

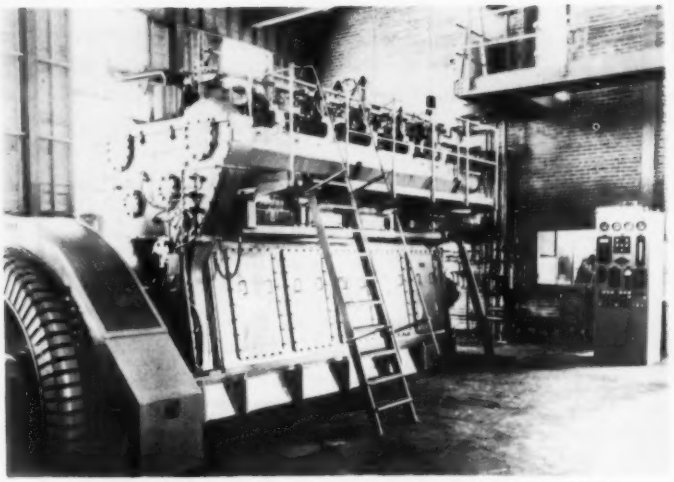
Test procedure is very simple—just place the Bloc-Chek in the radiator opening. With the engine running, gases will pass into a sensitized fluid through a special porous bronze filtering unit if there is a combustion leak. As the gas passes through the fluid the color changes from a deep blue to a light yellow. If no leak is present the fluid remains blue even though increased air pressure caused by heating or water pump cavitation results in air passing through the fluid.

After a positive reaction (color change), the location of the leak can be determined by cutting out fuel to one or two cylinders at a time. When the cylinder or cylinders causing the leak are firing, the liquid will change color. When only non-leaking cylinders are firing, the liquid will remain blue.

Residual Fuel Pays Off For Municipal Plant

By L. Long— Supt. Electrical Dept.
City of Edmundston, New Brunswick, Can.

Here's how a Canadian power plant defeated rising distillate costs by burning residual fuel in their diesel engine.—Now savings are high.



Hamilton diesel rated 2400 hp at 257 rpm burns low-cost residual fuel. It is a 5-cyl, 21½ x 27½-in bore and stroke, port-scavenged, 2-cycle engine equipped with a rotary exhaust-valve system.

BURNING residual fuel saved the city of Edmundston $44,000 last year. At this rate the diesel generator set should pay for itself in less than six years just by fuel savings alone.

Background

From 1911 to 1946, the City of Edmundston, New Brunswick, had supplied its own power needs by hydro-electric generation. In 1946, two 1000-hp diesel generators were added to increase capacity and to supplement hydro-electric generation in times of low water.

In 1952, it was seen that electric capacity would have to be increased again to meet the growing power demands of this Canadian community. Edmundston's City Council called upon the consulting firm of H. G. Acres & Co., Niagara Falls, Ontario.

The goal was to find the equipment that would combine the greatest flexibility possible with the most economical operation. The engine chosen was the Model 521 SA diesel made by the Hamilton Div., of the Baldwin-Lima-Hamilton Corp. This unit was installed in May 1955.

Operating cost of this unit averages 7.2 mils net per kwh as compared with the 12.4 mils net per kwh cost of the engines operating on distillate fuel. The difference represents an annual saving of $44,000 in fuel costs. Distillate diesel fuel cost is 18.6 cents per gallon compared to 11.6 cents a gallon for Bunker "C" residual. Heat rate of the residual fuel is 10,820 btu per net kwh.

Further savings are expected when the heavy-fuel feed line electrical heating equipment is replaced by hot water using a heat exchanger installed in the engine exhaust pipe. A reduction in cost per kwh from the 7.2 mil figure to 6.5 mils is anticipated.

Operation

The engine's success in operating on residual fuel is due to its rotary exhaust valve system. This enables it to burn the heaviest fuel with clear exhaust. The valve controls exhaust gas scavenging so that 40% more clean air is retained in the cylinders. The extra air charge, along with a high-turbulence combustion chamber design, provides the required combination for burning residual oil.

Scavenging air is provided by a motor-driven blower equipped with a fully automatic inlet guide vane control. This regulates scavenging air pressure in proportion to engine load. The 250-hp, 3550 rpm, 2300/4160-v motor is connected directly to the generator terminals. Generator differential relays are compensated for this connection by blower overloads which will trip the main generator oil circuit breaker and engine overspeed mechanism as a special safety feature.

Fuel System

The fuel system is arranged to use both residual oil and light oil. Light fuel is used while starting and for about 20 minutes before shutting down to flush the fuel lines and injectors, heavy-residual for normal operation.

Conventional design of the light-fuel system includes storage and day tanks, level controls and pumps. It is primed by a hand-operated pump.

Heavy oil is stored in two 20,000-gal tanks equipped with steam heating coils and automatically controlled suction heaters. Steam is supplied to the storage tanks and unloading pump house through 4-in. lines installed underground with condensate return and fuel piping. The lines are group-insulated to maintain full oil heat.

After leaving the main storage tank, oil is conditioned by a self-cleaning, 330-gph centrifuge. Then it is stored in a 3000-gal clean oil tank located in the power plant basement. It is pumped into a 275-gal day tank as needed.

Fuel piping is arranged so that light oil will feed automatically to the engine in case of trouble in the residual line. The two fuel lines feed into a "T" with check valves in each branch.

The light-fuel pump is engine-driven. Its outlet pressure is controlled by a pressure-regulating valve set approxi-

mately 10 psi lower than the similar heavy-oil system. When switched over to heavy fuel, light fuel recirculates back to day tank under pressure set by regulating valve.

Should pressure in the heavy-fuel system drop below the setting of the light-fuel system, light fuel will be admitted and a check valve on the heavy-fuel system will be closed. This double-check valve arrangement prevents mixing of the two fuels. Visual and audible alarms warn the operator if heavy-fuel pressure drops below normal and the engine is running on light oil.

The far end of the engine fuel oil header has a pressure-regulating relief valve set to by-pass fuel at all times. This assures correct pressure, constant flow and even temperature in the header. Spill from the relief valve is connected to a 3-way valve that is switched to the light or heavy-fuel day tank depending on the fuel type being used.

Care is taken that heavy-fuel spill is not returned to the light-fuel day tank. Light-fuel spill may be returned to the heavy-fuel tank, however, without causing trouble in the strainers and filters in that system.

Temperatures are maintained to give the proper oil viscosity required at each step in the handling. For example, viscosity must not be greater than 5000 SSU for pumping, 100 to 200 SSU for centrifuging and normally 70 SSU at the engine fuel header. Electric heaters supply engine fuel header requirements.

To heat the residual fuel during unloading and transferring to the plant, centrifuging and day tank, steam is supplied by a combination waste-heat boiler and exhaust silencer. Steam pressure of 12 to 15 psi is controlled automatically by pressure-actuated valves in a dump line and feedwater inlet. At full engine load, boiler output is 2500 lb per hr and 1600 lb per hr at ¾-load.

Boiler feedwater is treated with a blend of organic material and alkaline compounds of sodium sulfite and caustic soda. A standby boiler was not installed because heat for residual is required only when engine runs.

Sludge and other contaminants removed by centrifuging averages between 1 and 1.2% by volume. Of this, the concentration of water and sediment averages 20 to 30%. The accompanying table gives laboratory analyses of an oil sample before and after centrifuging. Typical clean and dirty fuels are shown in the photomicrographs at a magnification of 6000.

Cooling Water System

The closed-type engine cooling water system consists of a lube oil cooler, engine jacket water system and a conventional core-type radiator installed outside on a concrete foundation. At full load the radiator can dissipate heat from jacket water and lube oil at 84°F outdoor wet-bulb temperature. The radiator fan, driven by a dual-speed electric motor, provides effective temperature control and economy of operation.

The radiator fan motor develops 30 hp at high speed and 7.5 hp at low speed. High speed is usually needed when outdoor temperature rises to about 55°F. Jacket water temperature is controlled by a 3-way thermostatic control valve. A similar arrangement provides for the lube oil heat exchanger.

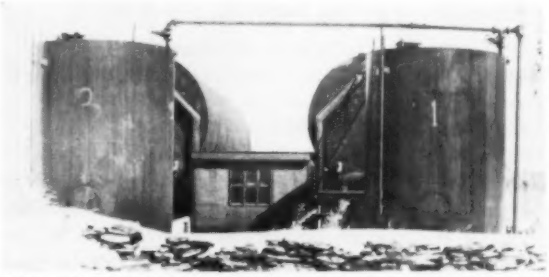
When outdoor temperature falls below freezing, anti-freeze containing rust-inhibited alcohol is used in the jacket water cooling system. A chromate treatment is employed during warm weather to protect against rust.

Hot water for space heating is obtained from the jacket water system and circulated through unit heaters by pumps when the engine is in operation.

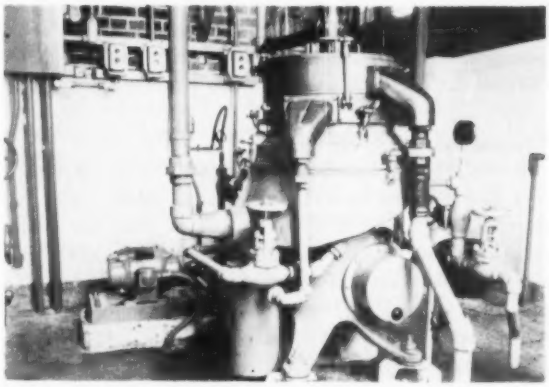
Lube Oil System

Mechanical forced-feed lubricators supply lube oil to the engine cylinders. A pressure system is used for piston cooling, bearings, exhaust rotary valve and gear case.

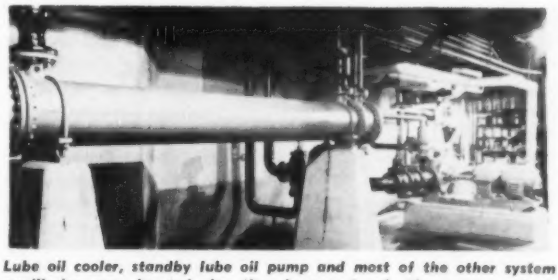
Cylinder lube oil is stored in a 200-gal tank in the basement and is transferred by electric pump to the lubricator reservoirs. Operation is controlled by a push-button located near the lubricators.



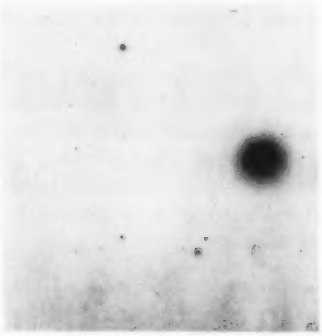
Light and heavy fuels are stored in these tanks until transferred inside. Building houses controls for oil lines and steam heaters



Centrifuge removes sludge and other foreign matter from residual.



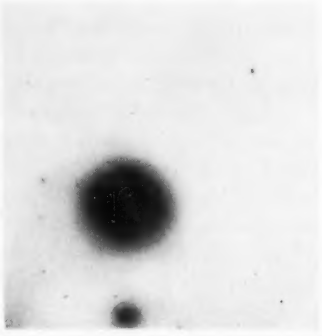
Lube oil cooler, standby lube oil pump and most of the other system auxiliaries are located in the basement of the power plant.



Microscopic examination of dirty residual fuel oil at left and clean residual oil at right shows the following particle distribution and size in microns.

Dirty Oil	Clean Oil
80% particles—1.0 to 2.2	97% particles— 0 to 2.0
15% particles—2.2 to 10	2% particles—2.2 to 2.4
5% particles—11 to 25	1% particles—4.5 to 40*
1% particles—26 to 60	

**Particles larger than 10 microns in clean oil are clumps of smaller particles averaging 4-6 microns. Remaining material shows tendency to agglomerate.*



The pressure lubricating system consists of a sump tank, engine-driven pump, electrically-driven standby lube oil pump, lube oil coolers, strainers, filters and check valves. Oil from the sump tank is passed through the filter continuously at a 400-gph rate by an electric pump. A high-detergent lube oil used in conjunction with cellulose-disc cartridge filters assures maximum cleanliness.

Electrical System

An English Electric generator is direct-connected to the diesel. It is rated 2345 kva gross, 2125 kva net, 60 cycle, 2300/4160 v. Its net rating is 1700 kw at 80% power factor. A 30-kw, 125-v, 1450-rpm, exciter is belt-driven from the main shaft. During starting, the exciter is rectifier-energized through special controls.

Bus voltage for all generating units is 2300 v. Each generator also has leads brought out for 4160-v connection. Switchboard panels for the Hamilton unit include the voltage regulator; oil circuit breaker; differential overload and reverse power relays; d-c ground fault detector; watt-hour meter; and all other normal indicating instruments for current, voltage and power factor.

Equipment Location

A metal-clad gaugeboard containing pressure indicators for light and heavy fuel, lube oil, jacket water and starting and scavenging air is located near the engine controls. The top section contains the alarm system for lube oil and jacket water low pressure and high temperature, heavy fuel low pressure and blower motor overload. Engine shutdown devices operate through relays on low lube oil pressure, high jacket water temperature and generator differential fault. Also on the gaugeboard are scavenging air regulating relay controls, blower motor meter and all push-button stations with indicating lights for engine auxiliaries.

The fuel centrifuge unit and blower are in separate areas adjoining the engine room. Directly above are two rooms containing the exhaust silencer and waste-heat boiler combination and the self-cleaning air filter. The silencer and blower are supported on four reinforced concrete columns and are completely independent of the building to reduce vibration. Engine air is taken from the outside during normal operation but a lever-controlled diverter in the air intake room permits air to be taken from the exhaust silencer room for cold-weather starting.

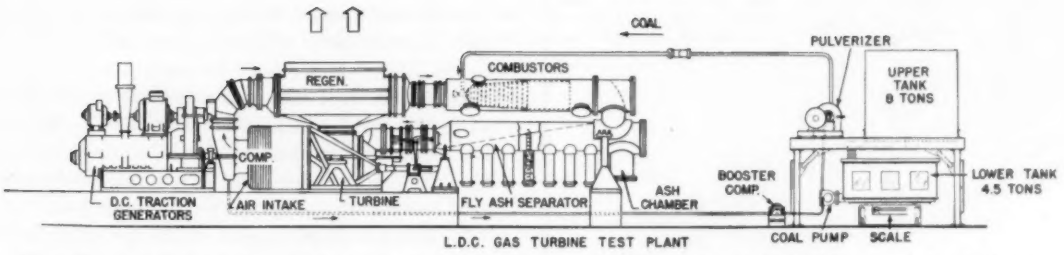
Most of the auxiliaries are in the basement. These include the lube oil cooler, sump tank and clarifier; jacket water pump; steam condensate tank; 275-gal heavy and light-fuel day tanks; boiler feed pump; 3000-gal heavy-fuel tank with steam and electric heaters and all piping connecting the auxiliaries to associate equipment.

Heavy Fuel Analysis

	Dirty Oil	Clean Oil
Specific gravity 60°F	0.997	0.996
API gravity 60°F	10.4	10.6
Flash point (open cup°F)	290	280
Fire point (open cup°F)	325	320
Viscosity (SSU 100°F seconds)	3170	3175
Viscosity (SSU 180°F seconds)	274	275
Viscosity (SSU 210°F seconds)	155	155
Viscosity (Furol 122°F seconds)	127	128
Sediment (hot filtration, % by weight)	0.27	0.07
B.S. & W. ASTM-52T (% by volume)	1.40	0.25
Carbon residue (% by weight)	11.17	10.77
Ash at 550°C (% by weight)	0.100	0.070
Water by distillation (% by weight)	0.20	0.04
Sodium, uranyl acetate (% by weight)	0.0086	0.0032
Sulphur (% by weight)	0.620	0.349
Vanadium (% by weight)	0.019	0.010
Pour point	+30°F	+30°F
Btu/lb	18,300	18,330

Principal Equipment

Engine	Baldwin-Lima-Hamilton Corp.
Generator	English Electric of Canada, Ltd.
Exciter	Imperial Electric Co.
Blower	Canadian Sirocco Co., Ltd.
Blower Motor	Canadian General Electric Co.
Governor	Woodward Governor Co.
Injection Equipment	American Bosch Arma Corp.
Centrifuge	De Laval Separator Co.
Filters	Purolator Products, Inc.
Pumps	De Laval Separator Co.
Heaters	Davis Engineering Corp.
Mechanical Lubricators	Madison-Kipp Corp.
Coolers	Young Radiator Co.
Filters	Hilliard Corp.
Auxiliary Pump	Blackmer Pump Co.
Jacket Water Pumps	Ingersoll-Rand Co.
Radiator	Young Radiator Co.
Waste Heat Boiler & Silencer	Maxim Silencer Co.
Switchgear	Canadian General Electric Co., Ltd.
Control Board	Westinghouse Electric Co.
Air Filter	American Air Filter Co.
Alarms	Viking Instruments, Inc.



Locomotive coal system and power plant used during 1956-57 tests. Note aerated coal tank and pressurized pulverizer.

Gas Turbines Burn Coal Too

A progress report details the developments leading to the successful use of coal as a fuel in gas turbines for locomotives.

EVEN in the gas turbine field, the search is on for methods to use successfully cheaper fuels. This search has been intensified in recent years for several reasons.

For one, gas turbine thermal efficiency is not yet equal to that of its competitor the diesel. For another, it is faced with the same increases in fuel cost plaguing the diesel field. There is also the ever-present threat of a national emergency that could result in serious shortage of fuel oils.

L.D.C. Program Background

With these facts in mind, the Locomotive Development Committee (L.D.C.), a part of Bituminous Coal Research, Inc., was formed. Their purpose was to develop a means to continue the use of bituminous coal as locomotive fuel. This coal, the largest single source of freight revenue to eastern railroads, would also be their least expensive fuel in terms of cost per million Btu if it could be used efficiently. Hence the reason for concentrating on coal as the fuel for gas turbines which are considered to have a good future in locomotive service.

A study of gas turbines existing or contemplated in 1945 showed that 5000-hp units within locomotive space and weight limitations were possible. Full-load thermal efficiencies up to 24% could be expected for the regenerative cycle. These facts, plus the cost differential per million Btu of about 4-to-1 in favor of the bituminous coal over diesel fuel, started the L.D.C. program to develop the equipment required to permit the open-cycle gas turbine to burn coal efficiently. In 1946, the L.D.C. opened its laboratories in the Alco Products, Inc. plant at Dunkirk, N. Y. All high pressure, full scale work has been done there.

Three major problems were involved. These are:

1. Feeding coal of suitable size to a pressurized (30-90 psia) combustion chamber under constant control at 500 to 5000 lb per hr.
2. Burning coal with more than 90% completeness of combustion from 200 to 900°F and outlet 700 to 1300°F.
3. Prevention of troubles caused by the coal's ash content.

All three problems were worked on at the same time.

First Coal-Burning Gas Turbine

The first operation of a full-scale coal-burning gas turbine took place at Dunkirk in 1949 when a Houdry-process turbine lent to the L.D.C. by the U. S. Bureau of Mines was put into service. Its principal feature was the provision of coal combustion and ash-separation equipment which could operate at full pressure (60 psia) and temperature (1300°F). Half of the compressor discharge was led through the coal-combustion system. The other half was led to the separator outlet to reduce the coal-heated air to 950°F, the maximum tolerated by the turbine.

Pulverized coal was supplied to the Houdry unit combustor by the bin-and-feeder system. A Whiting impact pulverizer was fed by a special Iron-Fireman stoker. Pulverized coal was stored in a tank which was mounted on scales. A rubber-rotor feeder fed the pulverized coal into a constant-speed rotary coal pump which transferred the coal to the 60 psig conveying air line.

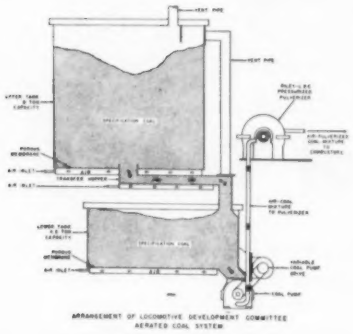
After 1250 hours of coal-burning operation and testing of this unit, the fly ash separator was able to give adequate protection to the turbine blades. The final 250 hours (ending on Dec. 20, 1951) represented the first consistent sustained operation of a gas turbine power plant with coal as its only fuel.

Direct-Fired, Coal-Burning Turbine

In these tests, much of the development and testing on the original components for a direct-fired, coal-burning gas turbine took place. Such items as combustors, fly ash separator tubes, pressurizing coal pumps—feeders, and coal-burning nozzles were included. These were used in conjunction with the next unit tested by the L.D.C. This was the Allis-Chalmers 4250-hp. locomotive-type gas turbine.

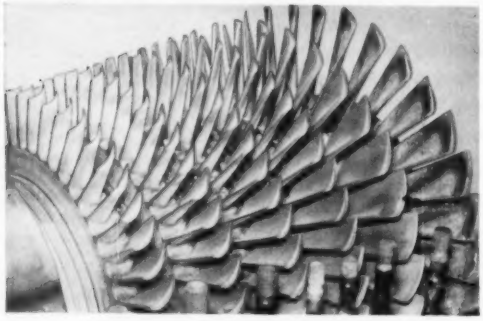
Solutions to the problems of pressurizing, combustion, and ash separation were tested on this 4250-hp turbine

Dome of combustor is found clean after final 140 hours of the 1955 test. Major change in dome design was made during the last 200 hours of this test.

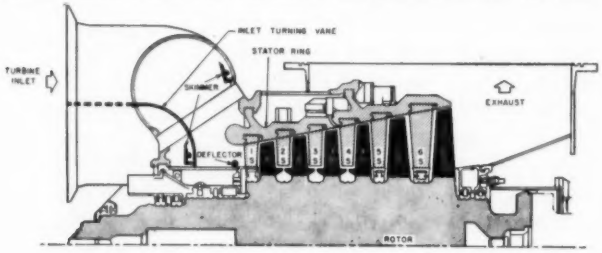


Crushed coal is delivered by a rotary pump into conveying air which carries it through pressurized pulverizer to combustors.

Rotor blades in row 1 are in good condition. Row 2 shows slight wear. Erosion is increasingly evident in rows 3 and 4.



Skimmers on concave faces of turbine inlet configuration draw off fine ash particle concentrations. This was one of changes made before 1956 tests.



during four series of tests from 1954 to 1955. The first test in 1951, 178 hours and the second in 1952, 755 hours, showed that it could operate smoothly with only coal as fuel. A third test of 301 hours was run in 1954 and the last in 1955, was for 1421 hours.

Improvements were continually made on all components during the 1951 to 1955 tests. In the 1955, 83 day tests, 4,111,400 hph were generated at an average load of 2894 hp, (81.7% load factor) and 2250 tons of bituminous coal were burned. The value of this coal, was $11,300.

Locomotive diesel engines doing the same job would burn about 256,000 gal of fuel oil. Allowing 6% of the fuel cost for lubricating oil, the total cost would be $28,745. The saving, due only to the use of bituminous coal at 20 cents per million Btu instead of diesel fuel at 83 cents per million Btu, is about $17,450.

During the high-load phase of these tests, the plant was not voluntarily shut down except at the end of 13-day working periods. The most important cause of shut-down was accumulation of ash deposits in the combustion system following prolonged periods of full-load operation.

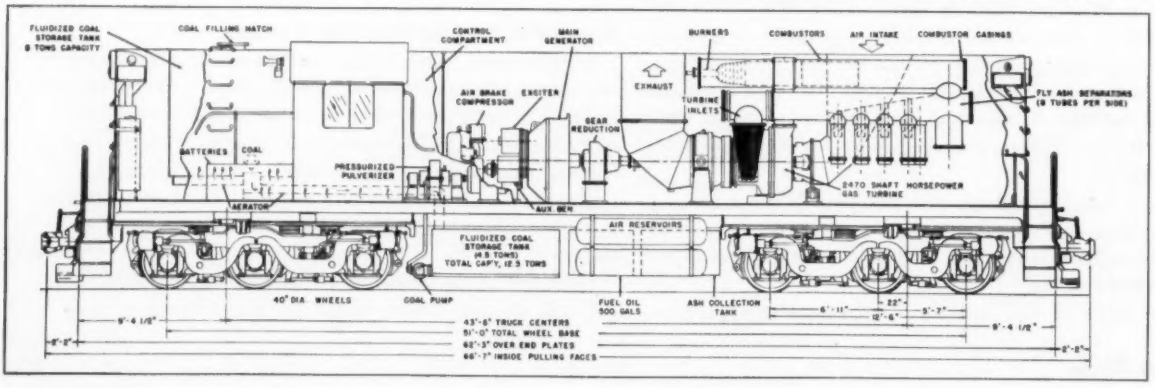
Inspection & Test Evaluation

At the end of this 1421-hr test, the plant was dismantled for a complete inspection. General appearance of the turbine was good. Concave faces of the rotor blades were clean, although a small amount of ash adhered to their convex faces. Light ash deposits were found on the backs of some of the stator blades, but only the third stage had ash coatings thicker than 0.005-in. The bearings, glands, and interstage seals were in good condition.

Periodic inspection of the first stage stator and the last stage rotor blades during the test program had indicated that some localized wear was taking place. There had been no apparent change in turbine performance, however. When the interior of the turbine was inspected, the blades in stage one were found to be in good condition. Row two showed slight signs of wear while erosion was increasingly evident in rows three and four.

Normal blade wear was confined to 0.005 to 0.010-in. on the concave surface. Abnormal localized wear was confined principally to the roots of the third and fourth-row blades where notches exist in the trailing or discharge edges. These notches served as stress concentration points from which cracks extended partially across a total of 27 blades. However, no such cracks occurred during the 1952 tests. The S-590 alloy used in the original rotor blades had

Proposed locomotive would have existing direct-fired gas turbine in place of 2250-hp diesel. Coal tank would be in locomotive underframe.



considerably higher strength at high temperature than the 19-9DL alloy used when the turbine was rebladed prior to the 1955 tests.

Combustion efficiency was consistently above 95% with each of the coals burned during 1955. Combustors were in serviceable condition. The principal problem was retention of ash in the combustors following long periods of high-load operation. A marked improvement resulted from a major change in the burner dome made during the last 200 hours. Fly ash separation equipment was in good condition.

The 1955 tests were run with the bin-and-feeder coal system originally installed in 1951 to handle run-of-mine coal. It handled ⅜-in. and 3/16-in. x 0 coals without difficulty but was complicated, heavy, and expensive. About 15% of the finest pulverized coal was vented in the air discharged from the collectors.

Aerated Coal System

In 1953, L.D.C. was told to develop a new fuel system to handle specification coal as a "fluid" on a locomotive. This coal system has been developed and constructed and is currently undergoing tests at Dunkirk.

In this system, 3/16-in. x 0 dried coal flows from aerated tanks without need for mechanical conveyers. Finely crushed specification coal is handled as a fluid in this completely automatic system. The pulverizer, built by the Riley Stoker Co., is based on designs prepared in cooperation with the L.D.C. A rotary pump delivers crushed coal into the conveying air. This carries the coal through a pressurized-unit pulverizer to the turbine combustors.

The rotor blades of the turbine have been modified to reduce dust damage. Skimmers installed on the curved surfaces of the turbine-inlet configuration draw off fine ash particle concentrations. Although no definite evaluation can be made until after 1000 hours of testing, there have been no signs of wear, erosion, or other distress on the blades after the first 900 hours of operation.

Conclusion

The studies of the L.D.C. on locomotive arrangements have been directed into two channels.

(1) Replacing the diesel engines in existing locomotives with direct-fired, coal burning gas turbine power plants. L.D.C. plans show that an existing gas turbine can replace a 2250-hp diesel and that the necessary coal can be carried in a tank in the underframe and on the locomotive proper. This would permit re-rating the locomotive to 2500 hp with a cruising range of about 20 hours.

(2) Other plans show a possible method of building direct-fired, coal-burning gas turbine locomotives. The power plant is mounted on a 6-motor power cab accompanied by a trailing unit providing 40-tons of aerated coal with a cruising range of about 30 hours. This would result in a locomotive of 3600-4000 hp and the addition of a second power unit would give an A-C-A locomotive with a 7200-8000-hp rating and a 15-hr cruising range.

All of the existing components of the Dunkirk test plant can be used in these locomotive designs.

GOVERNOR TEST STAND A MUST FOR ACCURACY

BE sure a governor is properly tested and calibrated before you put it on your engine. Final adjustments can then be made easily.

Accurate governor testing and calibrating can only be done on a test stand. One such test stand for use with hydraulic governors is that made by the Marine Pump Div. of the Diesel Control Corp. This unit originally was developed for testing and calibrating high speed engine hydraulic governors. Now the Unitest Model D11-10,000 is equipped with adaptors for large engine and turbine governors. Five separate mounting fixtures permit adaption of most of the popular governors such as the Woodward, Farris Pickering and Marquette types.

The test stand is used for testing and proving that all governor parts are working properly. It is also used for determining the amount of droop in all standard types of low, medium and high-speed hydraulic governors. It simulates actual governor operating conditions as though installed on the engine. Manual variations of the driving-motor speed are controlled by the governor on test. Ability of this governor to maintain engine speed can be predetermined by measuring the amount of droop and other governor characteristics.

The test stand has its own lube oil tank, filter and thermostatically controlled heater system. A lube oil pump is provided for filling the governor and for use with governors which require pressure service to the unit.

Gauges for oil pressure, temperature and governor speed are located on the panel. Switches are provided for the lube oil pump, heater circuit and governor driving motor.

An electronic variable-speed drive gives a wide range to meet requirements of all standard hydraulic governors. Infinite speed adjustments are possible for accurate setting and operational adjustment.

What Readers Write—

Diagnosing Troubles

EVER time a pump wrong? It's being done more frequently than most of us like to admit. Wrong timing cuts engine output, increases fuel consumption, gives smoke and may even cause damage. Yet, though mechanics are fully aware of how sensitive diesels are to fuel timing, many engines still are improperly timed.

It's one thing to make an engine run, its another to make it produce rated output with least fuel consumption. I have found that one of the easiest mistakes a mechanic makes is timing the pump to the engine 180 deg out of time. If the pump is 180 deg out, the piston is 360 deg out on a 4-cycle engine, therefore the cylinder receives its fuel near the end of the exhaust stroke.

Some engines will run with the pump 180 deg out. Recently I ran a dynamometer test on a Hercules DJX engine. It showed that it will run and pull with fuel being injected on the exhaust stroke. This engine produced 60% of its rated horsepower, very little smoke and responded to a load change instantly.

There are several other engines that will run with the pump timed 180 deg out. Therefore, this is a good thing to check when the engine is hard to start and the customer complains about a power loss after the pump has been timed to the engine.

For example, I recently checked a Mack truck that had been rebuilt, but produced practically no power. No. 1 plunger started to inject just as the No. 1 exhaust valve was opening. Yet the truck was driven several miles to me.

Some engines have flywheels that can be installed more than one way making the pump timing marks out of phase with the piston and valves. This is something to remember when

(*Continued on Page 68*)

Pump Timing Pointers

KNOW what you're going to do before you start. Don't muddle your way through a job—it'll show up in the results. Since engines and their accessories are continually improved you can't always rely on previous knowledge. You've got to keep on your toes on latest maintenance techniques and equipment modifications. I've done this though instruction manuals, trade papers, your magazine and direct contact with equipment manufacturers.

I know men who have operated and maintained older low-speed, heavy duty engines for years. Yet even these experienced men were confused when assigned to handle a modern diesel. Water and lube oil temperatures and pressures are different. So are the clearances.

However these men were not too proud to run for the instruction manual frequently—especially for maintenance data and techniques. Such should be the case with all involved in the operation and maintenance of diesels and their accessories. Find out what it's all about and then do it right.

There are many sounds and other indications of troubles which may be misleading. Don't go off half cocked—diagnose them thoroughly and cut maintenance costs and engine downtime. Here's an example on diagnosing a sign of trouble and how to take care of it.

For example, don't pull pistons and take apart the pin or conrod bearings immediately when a 2-cycle engine knocks. In the first place you may destroy important evidence and possibly even upset perfectly good operating clearances.

And secondly, excessive clearance at the piston pin and conrod bearing would not cause knocking in a 2-cycle engine. Generally it's due to other causes such as faulty timing; faulty

(*Continued on Page 68*)

Keeping Tabs on Parts

KEEP mated parts together in and out of the engine. Forget which matched parts go together or where they belong and you're really in trouble. For example No. 1 hydraulic valve lifter should go in the No. 1 spot, No. 2 in the No. 2 spot, and so on. Also, the parts of this No. 1 valve lifter must not be interchanged with those of any other.

It is extremely important that parts be identified correctly after they're removed. Upset their order and fits and clearances will be messed up.

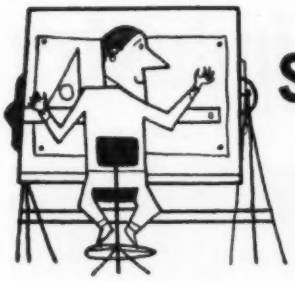
I've found that old methods such as memory, pencil marks, tags and masking tape either take too long, damage polished surfaces or are not permanent enough. Therefore I have resorted to the "hole or slot in board method" shown.

The rows of holes or slots in the board are identified by numbered tacks such as those used on storm windows and screens. These tacks, with numbers stamped on the heads, are driven into the wood alongside the parts to be identified. They are difficult to displace by handling and identification can't be destroyed by greasy hands, etc.

This permanent numbering system is also good when it's necessary to inspect parts referred to by number.

Several cards full of these tacks are always kept on hand and use in the past has often prevented costly mixups.

Arthur R. Tanner Jr.
(Poughkeepsie, N. Y.)



service section

Recent engine and equipment modifications, procedures and recommendations straight from the different manufacturers to you

Engine Material		Water Filter and Coolant Cond.	Summer Operation Rust Inhibitor Type		Winter Operation Ethylene Glycol Base Permanent Antifreeze*
Block	Head		Chemical	or Soluble Oil	
CI	CI	No	Yes	Yes	Yes
CI	CI	Yes,	No	No	*
AL	CI	No	No	Yes	Yes**
AL	CI	Yes	No	No	*
AL	AL	No	No	No	Yes
AL	AL	Yes	No	No	*

*Do not remove or renew water filter and conditioner element when antifreeze solution is added or while the antifreeze remains in the system.

**Permanent antifreeze solution with a soluble oil rust inhibitor to prevent possible electrolysis.

GM "71" & "110" Cooling Systems

A corrosion inhibitor should be added to the water in the cooling system of the engine during the summer unless the engine is protected by a coolant filter and conditioner.

During the winter, a permanent ethylene glycol base antifreeze should be used. However, a recommendation as to the proper type of corrosion inhibitor and antifreeze is required because both aluminum and cast iron cylinder blocks and heads are used on Series 71 engines. Aluminum engine cylinder blocks have been used with either cast iron or aluminum cylinder heads.

The proper method for treating the cooling water to prevent corrosion and freezing from occurring within the engine varies with the metals used in the engines.

The accompanying chart shows the various block and head metal combinations and indicates the required corrosion inhibitor and antifreeze recommendations. The coolant filter and conditioner has been added to the chart to answer questions that have arisen since its introduction.

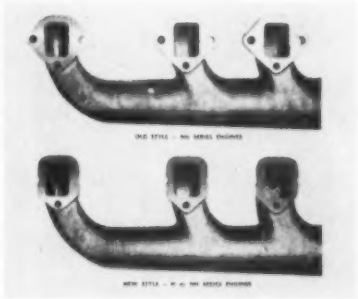
Fuels for IH Diesel Engines

Two grades of distillate fuels are generally available for high-speed diesel engines throughout the United States: namely, furnace oils and diesel fuels. The two grades are identified as No. 1 and No. 2 furnace oils or No. 1-D and No. 2-D diesel fuels.

The No. 2-D grade diesel fuels are recommended for use in IH diesel engines for the following reasons. They have greater heat content and higher viscosity, giving greater power and longer injection pump life than the No. 1-D diesel fuels and greater uniformity in composition and greater storage stability than the No. 1 and No. 2 furnace oils.

Many suppliers are marketing No.

(*Continued on Page 72*)



Cummins H & NH Exhaust Manifolds

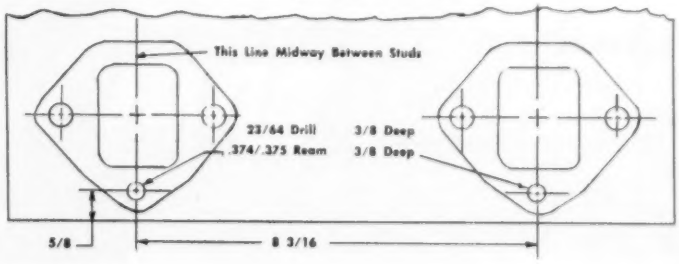
Exhaust manifolds are available which are interchangeable between H and NH engine series. Changes required to use the new manifolds on engines now in service are described below.

H Series Engines:

Clamp pads on the new exhaust manifolds are higher, and a new clamp, Part No. 105290, compensates for the difference in pad height when used with old-style intake manifolds.

NH Series Engines:

The mounting ears have been removed from the NH exhaust manifolds, and dowels have been added below the exhaust ports on the cylinder head. New-style exhaust manifolds can be used on NH cylinder heads now in the field by machining and adding dowels, Part No. 105199, to the head as shown in the sketch.



news of our industry

IH Crawlers Cut Moving Costs

As much as $600 and 12 hours are saved each time Odessa Rig & Equipment Co. moves its assembled drilling rig. The time and money saver is a pair of International crawler tractors.

If hauled by truck, the 120-ft derrick must first be jackknifed and the 200,000-lb rig disassembled. With the tractors as movingmen, the massive bulk of the rig travels completely assembled along with the draw works. The entire rig platform is lifted by hydraulic jacks and four crawler-type treads are placed under the corners. A TD-18 unit prepares the new site in advance and clears the route over which the TD-24 inches the derrick. If soft earth stalls this crawler, the TD-18 helps out.

new products . . . . . Page 56

organizational news . . . . Page 60

new literature . . . . Page 64

Twin Axles Trim Concrete Costs

At work here on a paving project are two special GMC trucks with twin front and rear axles. Conversion of the cab-over-engine GMC's into double axle units was made by Hahn Motors, Inc. of Hamburg, Pa.

Controlled from a single steering gear assembly, the front axles move in unison. By spreading the weight over the twin axles front and rear, the vehicles can carry 2½ more yards of concrete on each trip. Thus, delivery costs have been chopped about 30% according to Warner Co. officials. This Philadelphia concrete hauler now has 26 of these 8-wheel FWX-660 GMC's in service.

Pot Holder Pinch-Hits for Push Rod

With no parts dealer exactly nearby, members of Operation Deep Freeze pitch in to fashion a needed part. With a hammer, a pair of pliers and a blow torch, the resourceful men turned a pot holder into an engine push rod. The makeshift part lasted long enough for a Caterpillar D-8 tractor to complete its return trip to Little America V a week later.

Prime Mover Control Conference Scheduled

For men who want to know more about governor functioning and repair, mark September 3 on your calendar. That's the date set for the 3-day Prime Mover Control Conference. This 21st annual meeting will be held at the Woodward Governor plant in Rockford, Illinois.

More Students Today— More Mechanics Tomorrow

Snap-on Tools Corp, is one of the many firms doing something about relieving the shortage of mechanics. They're taking paid space in vocational training publications with that objective. It's a severe problem in industry everywhere. For example, Snap-on points out there is only one mechanic for every 82 cars in use. Similar shortages are reported in the diesel field. With industry cooperating, maybe we can get something done about this national shortage of mechanics.

Electro-Motive Honored

The 1957 Elmer A. Sperry Award will go to three individuals and four sections of the engineering department of Electro-Motive Division, GM. The citation, jointly sponsored by ASME, AIEE, SAE, and SNAME, is based on EMD contributions to diesel-electric locomotive development which helped revolutionize American railroading.

Sharing the award will be: Harold L. Hamilton, founder of Electro-Motive, who was its leader through the entire period of the development until the GM diesel-electric was accepted in all branches of U. S. railroad service in 1940.

Richard M. Dilworth, former chief engineer of EMD, who headed the research and design work which resulted in the first successful use of the diesel-electric as a prime mover of trains of all classes.

Eugene W. Kettering, now director of research, who from 1936 to 1942 was in direct charge of the development of GM 567 series diesel.

Four sections of the engineering department cited are the controls, electrical engineering, locomotive and mechanical engineering sections.

Young keeps vital engines cool in desert hot-spot!

1,000 hp units operate at full load in world's hottest location

Not even the fierce heat of Kuwait or general water shortage in the area can impair the efficiency of the Young equipment used to cool the jacket water, supercharger intercooler water and engine oil on the engines of the four 1,000 hp pumping units designed and built by the Enterprise Division of General Metals Corporation of San Francisco.

Young equipment identified above: (1) Radiator Model MWC-455 with separate cooling sections for jacket water-supercharger intercooler water and engine oil. (2) Young Mono Weld ® construction turbo-charged air intercooler. (3) Model OCS-300 Torque Converter Cooler.

"WHERE QUALITY COUNTS"

Let Young Radiator solve your heat transfer problem. Write today to Dept. 417-H for catalog 1356. There is no obligation.

Young RADIATOR COMPANY
RACINE, WISCONSIN
Creative HEAT TRANSFER ENGINEERS
Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Mattoon, Illinois

NAPIER
SETS CRACKERJACK CLIP ON LAKE MARACAIBO!

All-weather craft speed oil workers to drillings

Employees of the Compañia Shell de Venezuela are now transported 25 miles to offshore drilling platforms in large, Napier Deltic-powered crew boats which get there 50% quicker than the fastest vessels now in service. This is a big advance on existing slow surface transportation or helicopters with small payload and high operating and maintenance cost. Power for the boats comes from two 9-cylinder opposed piston diesels. These Deltics with their "triangle" of cylinders ensure an amazing balance and freedom from vibration even with 1,620 h.p. in the engine room.

Fast, reliable, all-weather movement of men and materials has become a must for all offshore oil operations if they are to run on an economic round-the-clock basis. Napier Deltics provide twin-engined reliability and drive the fully-loaded, 50-passenger Shell Boats at an easy and safe 35 m.p.h. under continuous cruise conditions.

Plans of Napier Deltic-powered crew boats specially designed for Gulf operation are available. For more information on the Deltic diesel contact the Napier Representative—L. O. Brooks, 909 Dupont Circle Building, Washington 6, D.C. Phone North 7-0146.

NAPIER DELTIC MARINE DIESEL

A new conception of Marine Power

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Partners in Progress with The ENGLISH ELECTRIC Company Ltd.

CRC D27

news of our industry

Driver Training Benefits

Effects of driver schools are far-reaching. Safety, improved performance and lowered maintenance costs are a few of the gains from such training.

North Carolina Truck Driver Training School will mark its ninth year this September of training more than 2000 drivers from nearly every state as well as from Alaska and Canada.

Their courses cover Interstate Commerce rules, accident prevention and reporting and other fundamentals—and, of course, practice of basic driving skills on highways and in cities.

Fiftieth Birthday for Park

Park Drop Forge Co. just celebrated its 50th anniversary. Organized in Cleveland in 1907, the company has expanded until today its buildings cover over 10 acres.

One of the original founders, Windsor T. White, still serves the company as chairman of the board.

Originally engaged in producing automotive crankshafts, the firm now makes components for diesel locomotives, pumps, tractors and a host of other units. Park makes heavy-duty crankshafts up to 5000 lbs, and over half the diesels on U. S. railroads are driven by Park die-forged crankshafts.

SDME Season A Success

Society of Diesel Maintenance Engineers closed a most successful season. Latest associate chapter formed is in West Point Pleasant, New Jersey, and other groups are considering establishing chapters.

Nine meetings were held with an average of 85 men attending each. Some of the subjects aired at the sessions follow: Air Cleaners—Wet vs. Dry; Engine Temperatures Related to Engine Wear; Ford Major Diesel Engines and Simms Fuel Systems; Valves; Massey-Harris Diesel Engines and Bosch Fuel Systems.

Anyone interested in this wide-awake organization should get in touch with the corresponding secretary, Keith Stephens, Milford, Nebraska.

news of our industry

Sales by Fairbanks, Morse

Fairbanks, Morse & Co. reports recent sales to eight companies. Orders range from one 12-cyl, 1920-hp Model 38D8-⅛ dual fuel generating set sold to the Village of Wells, Minn., to one 4-cyl, 300-hp Model 38F5¼ diesel generating set purchased by American Independent Oil Co., San Francisco.

Kenworths on Move To Dominican Republic

Ten Kenworth Model 801 rock and ore movers, plus two Model 924 highway transports, are on their way to Compania Constructora Elmhurst, Ciudad Trujillo. Powered by Cummins industrial diesels, the twelve units will be used for road construction in the Dominican Republic.

Free-Piston Gasifiers To Singapore

As a replacement for steam power at the St. James power station, the Singapore City Council has purchased free-piston engines. The installation will supply a total output of 36,000 kw, made up of six sets of 6000 kw each. Each set consists of eight GS.34 gasifiers of 1000 hp each, driving an exhaust gas turbine and direct-coupled alternator. Free Piston Engine Co., Ltd., Great Britain, who is supplying the equipment, says this is the largest single order of its kind.

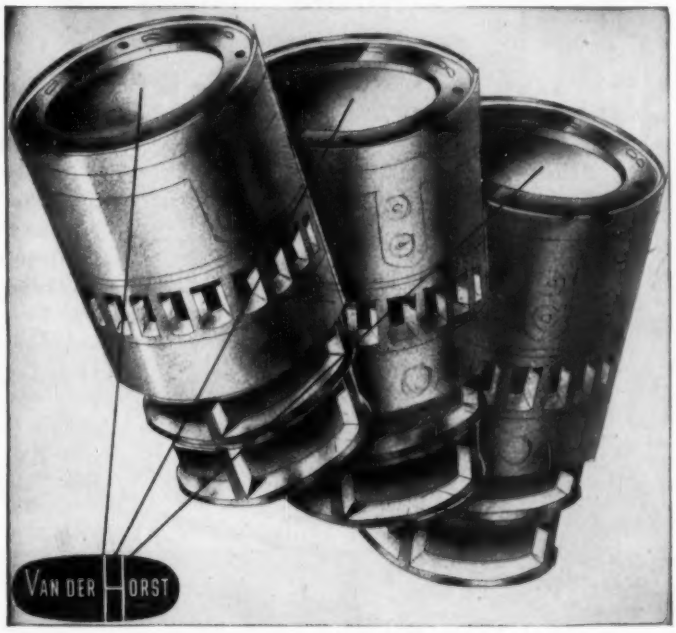
Trained Aids for Engineers

Wider use of trained engineering secretaries would greatly alleviate manpower shortages in the engineering field, states Andrew Williams of the Robertshaw Research Center.

The engineering profession is just now beginning to reap the benefits of the engineering secretarial training started two years ago at the Business Training College in Pittsburgh. The men and women graduating from this course free the engineer from details and routines, allowing him to devote more time to planning and developing engineering facilities of today and tomorrow.

(*Continued on Page* 68)

5 *big advantages of*



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PORUS - KROME — INCREASES CYLINDER LIFE 3 TO 5 TIMES.

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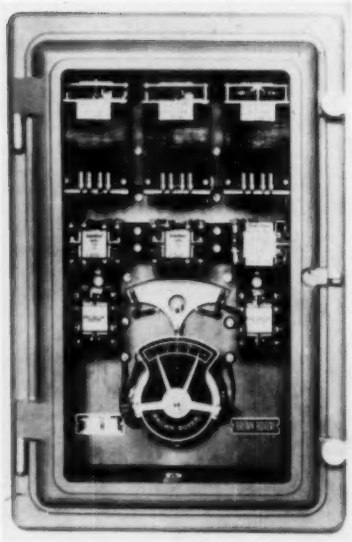


Automatic Speed-Matching and Synchronizing

A fully automatic Instant Synchronizer has made its bow. Produced by Brown Boveri Corp., it automatically matches the speed of the generator to the system. When the frequency difference is 0.5 cycles or less (which limits paralleling shock), the Synchronizer computes the proper lead time to activate the breaker. Thus its contacts will make at the exact instant of phase coincidence, and paralleling occurs instantly without necessity of actually holding synchronism.

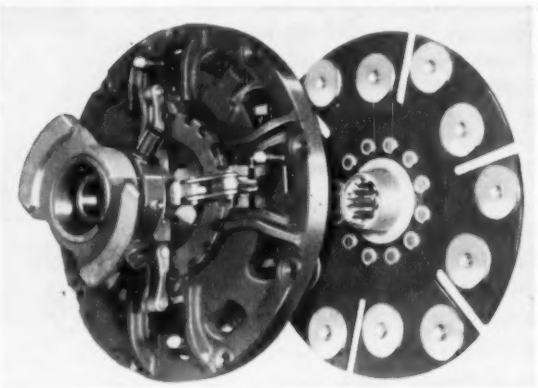
This Brown Boveri Synchronizer uses no tubes or transistors. Even under severe operating conditions, they state, it may remain set up for hours without risk.

Lift Truck for Handling Heavyweights

Allis-Chalmers has added a 10,000-lb capacity lift truck to its material handling line. The new FT-100 with welded industrial-type frame is designed for toting extra heavy loads with ease.

The truck is available with diesel, gasoline or LP gas A-C engines. All provide the high torque at normal engine speed which is necessary for heavy work or up grades. Easy shifting is assured by a 2-speed, constant mesh transmission.

New roller type mast gives more lift without increasing overall lowered height of the unit. ITA shaft-type fork mounting carriage permits use of a wide range of standard attachments, plus those made-to-order for specific requirements.



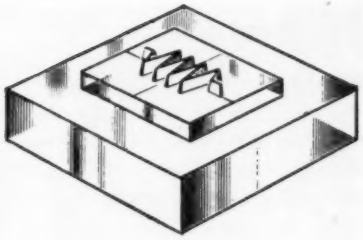
Long-Lived Clutch

New clutch arrangement, using friction material with a ceramic base, for use in heavy-duty and off-highway machines has been developed by Rockford Clutch Division, Borg-Warner.

Increased capacity, better heat disposal, more ventilation, cooler running, no fading, and more usable lining material are some of the improvements cited for this new type clutch.

According to the company, users of tractors, trucks, oil field rigs and other heavy-duty machines report these Morlife clutches and clutch plates provide more then double the torque capacity, four to ten times the work life with one-tenth the usual number of adjustments.

The new clutch is available in both over-center and spring-loaded types in a wide range of sizes up to 18 in., single and double plate.



Time Saver in Drafting

Draftsmen can save time by stamping routine drawing symbols instead of drawing them individually. All widely used symbols are now available from Krengel Mfg. Co., singly or in complete sets. The stamps are made of engraved, clear vinylite and are mounted on See-Thru lucite.

Sharp impressions, hairline accuracy and perfect alignment are claimed with the use of these See-Thru drafting stamps. Special metal stamp pad comes with these stamps.

Right-Angle Tool For Tight Spots

Mechanics can work around corners now with the right-angle wrench designed by National Reechet Corp.

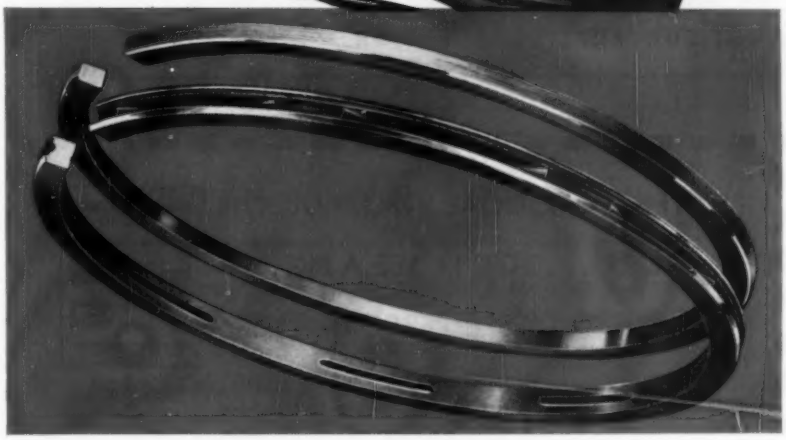
The tool incorporates built-in gears for tightening or loosening jobs in hard-to-reach spots. The Reechet, as it's called, fits all standard extensions, sockets and ratchets.

It reduces need for parts removal and does the job faster without uncomfortable bending. Spark plugs, for instance, can be removed while an engine is hot. The company claims use of this wrench can increase torque up to 200%.

PC rings

S-T-R-E-T-C-H

the time between overhauls



Perfect Circle piston rings are plated with thick wear-resisting solid chrome that more than doubles the life of cylinders, pistons and rings. Records prove PC Chrome-Plated piston rings give more hours of sustained power... more hours between overhauls.

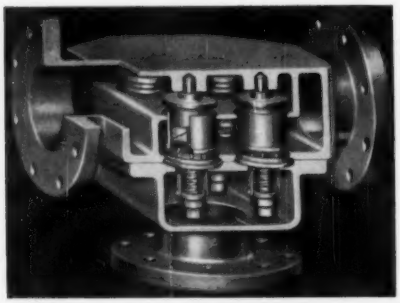
Leading diesel manufacturers use Perfect Circles as original equipment and recommend them for replacement service because they know Perfect Circles can be depended on for top performance under the most grueling conditions. Many types of Perfect Circles, designed specifically for diesel applications, are available.

The Perfect Circle engineering staff will gladly assist you with your piston ring problems... no obligation of course. Perfect Circle Corporation, Hagerstown, Indiana; The Perfect Circle Co., Ltd., 888 Don Mills Road, Don Mills, Ontario, Canada.

PERFECT CIRCLE

PISTON RINGS

More people prefer Perfect Circles than any other Brand!



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JACKET WATER & LUBE OIL THERMOSTATS

SAFETY Provided for by multiple independent elements as shown above.

√ Provided for by rugged AMOT element construction. No AMOT element has ever stuck closed since its introduction 6 years ago. Many years of "know how" are built into every AMOT element.

√ Omission of all hand operators means engine temperature is safe from tampering by engine attendants. AMOT is the only engine thermostat that can be considered safe without a hand operator.

√ Lack of capillary tubes, bulbs, and packing glands means no failures from kinks or leaks.

SERVICE There is only one replaceable part—the element. Renewal of element renews all working parts. Element replacement, if ever required, is several times faster than on any competitive make. Original accuracy of temperature setting is always provided in element replacement.

√ AMOT engineers are available in most major cities to help on application and other problems.

√ Most models are available from stock for rush orders.

MODELS ½" to 6" pipe sizes. Larger sizes in iron, bronze or ductile iron.

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PUT THIS PRACTICAL INFORMATION TO WORK . . . YOU'LL SEE A BIG DIFFERENCE IN DIESEL PERFORMANCE.

REGARDLESS of the make of the diesel you own or the brand of filter tanks you have, you can profit by reading this diesel filtration booklet. It embodies experience gained in over thirty years work in the diesel field.

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new products

Remedy for Piping Corrosion

Tube Reducing Corp. prescribes a new cure for piping corrosion headaches. It's a versatile method of applying nickel-alloy coatings to a wide range of ferrous metals.

This Niphos process is easily applied to all shapes and sizes. After application the coating is heated in a reducing atmosphere to provide a tightly-adhering nickel-alloy cladding. The maker states the coating will not peel or flake even when subject to a 180-deg bend. Such coating, they add, prevents scaling of the base metal at temperatures as high as 1150°F.

New Gelling Agent Added to Greases

A new organic thickener is used in a line of industrial greases introduced by Standard Oil Co. (Indiana). Four regular greases and three extreme pressure grades are marketed under the trade name of Rykon.

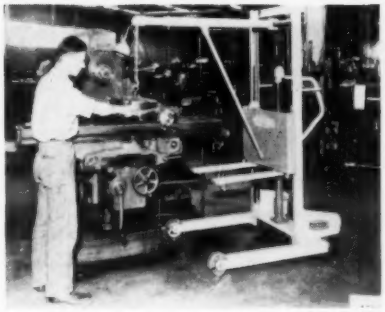
This non-soap thickener makes greases more stable than other gelling agents, according to the company. Capillary action of the fibers in the hydrocarbon agent holds the oil. Field tests on Rykon greases show they will remain grease-like and give lubrication at high temperatures over long periods.

Compact Precision Borer

For installations where space is limited, there's a new borer made by Greenlee Bros. & Co. Overall dimensions of the new Model S-6 Hydro-Borer are 29½ in. by 6¾ in. by 3¾ in. It weighs just 75 lb and is easily mounted on workholding fixtures or assembly jigs.

The S-6 is capable of boring within a tolerance of 0.0003 in. and producing a finish of 30 micro-inches or better.

According to the maker, simple construction of the Hydro-Borer assures low initial cost and low maintenance costs. The unit consists of a cylinder housing and oil reservoir, two meehanite bearings, boring spindle assembly, control valve and spindle drive assembly.



Idea for Handling Heavy Engine Parts in Shops

A new crane attachment is now available for Oster portable lifts of 1000- and 2000-lb capacity and 56-in. lifts. This attachment can be furnished with new machines or installed in the field on units already in use.

Boom extension is adjustable for lengths of 30-in., 36-in. and 42-in., with lift capacity of 500 lb, 420 lb and 375 lb, respectively. The attachment is demountable so portable lifts can be used with standard forks or platforms.

Degreasing Basket

Small parts won't get lost in the new degreasing basket designed by Atlas Products Co. Made of heavy gauge steel with plated finish, it has a sturdy handle, hooks and legs. The basket measures 3¾ in. deep with 10-in. diameter and has a 7-in. high handle.

High Temperature Lubricant

Electrofilm, Inc. has developed and tested a new high temperature solid film lubricant #2006 for operating temperatures up to 800°F. Further, under many conditions they will have applications up to 1000°F such as in the prevention of galling and seizing of threaded parts and fasteners and in rocket and jet engine controls.

Several thousand test machine hours have been devoted to this high temperature coating. In these tests the co-efficient of friction has been measured as low as .022 at high loads at 550°F.

This solid film lubricant suggests many possible diesel applications—energy cells, exhaust components, studs and other high temperature parts.

(*Continued on Page* 70)

THIS PARK DIE-FORGED CRANKSHAFT WEIGHS 3500 POUNDS

. . . is typical of 25 models from 1500 to 5000 pounds, made for diesel and gas engines

This "six throw" crankshaft, almost 12 ft. long, is representative of the large die-forgings Park supplies to manufacturers of gas and diesel engines.

Park's facilities include a complete die-sinking shop, modern specialized heat-treating equipment and experienced metallurgical and engineering staffs.

Our sales engineers will show you how Park die-forgings can increase strength and safety—cut down size and machine time on your requirements.

Die Forging Specialists Since 1907

THE PARK DROP FORGE CO.

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Carbon, Alloy, Heat-Resistant Alloy, and Stainless Steel Closed-Die Forgings from 4 lbs. to 5000 lbs.

organizational news

Oakite Representatives

Oakite Products, Inc., manufacturers of industrial cleaning, sanitizing and descaling materials and equipment announce the assignment of two technical service representatives.

Donald O. Mundale, who served in Asheville, N. C., has been transferred to Marion, Ohio. James E. Davenport, a graduate in engineering from the U. S. Naval Academy, has been assigned to Rocky Mount, N. C.

J. Davenport

D. O. Mundale

R. Ritchie

R. Hawkins

Zollner Sales Executives

Robert B. Hawkins has joined Zollner Corporation, piston manufacturer, as general sales manager. He will maintain offices both at the Fort Wayne plant and the newly opened district branch in Birmingham, Mich. This expansion represents a move toward increasing service to engine manufacturers, President Fred Zollner said.

Named to assist Mr. Hawkins is Robert Ritchie. Both men have long been associated with the automotive field.

Erie Forge Election

Directors of Erie Forge & Steel Corp. have elected A. R. Gaus president. He fills the place of E. H. Lang, now chairman of the board. This action was taken when Mr. Lang asked to be relieved of direct supervision after 55 years of service.

Prior to becoming vice president of Erie Forge in 1955, Mr. Gaus served the Midvale Company in the same capacity.

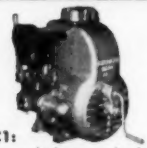
A. R. Gaus

E. H. Lang

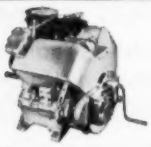
When Ordering Engine-Powered Equipment Up to 20 BHP . . . Be Sure to Specify American MARC Diesel Engines

AMERICA'S LARGEST MANUFACTURER OF AIR-COOLED DIESELS PRESENTS

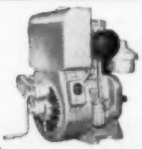
THE BIG 4 IN DIESEL POWER



AC1: Air-cooled, one-cylinder, 4-cycle, 6.5 BHP @ 1800 RPM

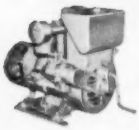


AC2: Air-cooled, two-cylinder, 4-cycle, v-type, 14 BHP @ 1800 RPM



WC1: Water-cooled, one-cylinder, 4-cycle, 7 BHP @ 1800 RPM

WC2: Water-cooled, two-cylinder, v-type, 4-cycle, 15 BHP @ 1800 RPM



A1Q Generating Plant: 3KW generator quill-mounted to American MARC air-cooled Model AC1. This and the Model A2Q Generator (5 KW) are ideal all-weather plants for marine, industrial, and rural electrical service.

AMERICAN MARC INC. dominates the field of lightweight, low-horsepower Diesels by building its diversified line from the "Big Four" basic models illustrated here. Purchase and maintenance of engines and parts are simplified by the use of these compact and rugged prime movers. All four types of American MARC Engines are employed daily by thousands of satisfied customers in industrial, agricultural, petroleum or marine fields.

AMERICAN MARC'S COMPLETE UNITS

Complete units for many purposes are also manufactured by American MARC—Diesel generating plants from 3 to 10 KW (AC or DC, and industrial three-phase), Diesel pumping units from 48 to 1700 GPM, marine propulsion, refrigeration units and power-packages for other services. American MARC can adapt any of its Big 4 engines to fit any job requiring from 6.5 to 20 BHP.

6-103

AMERICAN MARC INC.

1601 WEST FLORENCE AVE. INGLEWOOD, CALIFORNIA

Dept P-87

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GO RIGHT NOW
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KIM
Hotstart
electric pre-heater

Just plug KIM into the electric circuit. It draws cold water from the engine, heats it, then circulates it back through the engine. *Result*: quick starts regardless of cold weather; elimination of warm-up time; reduced engine wear and maintenance; responsive power the instant it is wanted. Thousands in use.

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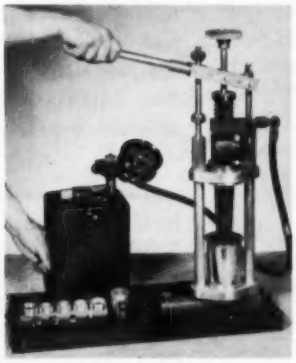
UNIVERSAL INJECTOR TEST STAND—
For Testing all Unit Injectors in One Fixture. Makes Plunger and Bushing Tests on all General Motors Unit Injectors.

KIENE HYDRAULIC TEST PUMP — For making all conventional Tests on Nozzles. Photo shows use with Universal Injector Test Stand.

KIENE CONNECTOR NUTS — For convenient Attachment of Equipment to Test Stand or Test Pump. All sizes Connectors available.



KIENE PORTABLE TEST EQUIPMENT

An entirely new and different product for the Diesel Industry offering features never before available in the field of Injection and Hydraulic repair and Servicing tools. Kiene Injector Test Stand and Hydraulic Pump give you all operating advantages of existing tools in addition to introducing many new and exclusive features. Kiene Products are Portable, Light Weight, Compact, Rugged and Revolutionary in Design. They are engineered to give the Field Service Man adequate tools for on the job diagnosis and quick repair of valuable Diesel Equipment.

SAVE MONEY—
SAVE DOWN TIME

Write for Bulletins KTP-50 and UTS-10

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

organizational news

Adams Name Changed

Adams Process & Engineering Co. is the new name of the diesel crankshaft reclamation division of Benning Auto Parts. The company's facilities have been enlarged and they offer a brochure describing their process of reclaiming EMD diesel crankshafts.

Le Roi Promotion

Donald M. McDowell has been named manager of engineering for Le Roi Division, Westinghouse Air Brake Co., Milwaukee. Since 1956 when Mr. McDowell joined the firm, he has been active in the development of new products for the construction and mining markets.

D. M. McDowell

More Diesel Control Expansion

For the second time in 18 months, the Marine Pumps Division of Diesel Control Corp., Wilmington, Calif., has expanded their plant to handle increasing volume of diesel sales, injection system servicing and test equipment manufacturing.

The new building, adjoining the one completed last year, will be used mainly for display and inventory of Buda engines and an extensive parts department. They will now carry a complete line of A-C engines and service parts for marine applications.

Diesel Control is also distributor for American Bosch, Roosa-Master, Bendix, Demco and Robert Bosch lines of fuel injection equipment. Their fuel system overhaul shops are fully air-conditioned and temperature controlled.

The firm also manufactures and sells the Unitest line of specialized fuel system test and calibrating equipment, and Spiralap lapping equipment for diesel manufacturers, fleet overhaul and repair shops.

Sales Engineer Joins Flexonics

Robert F. Barge has joined Flexonics Corp., Maywood, Illinois as sales engineer for Lake Erie and St. Lawrence area, with headquarters in Cleveland. He will be responsible for sales and service to all Flexonics customers, distributors and agents in Ohio, Pennsylvania and New York.

Twin Disc News

Appointment of E. B. Falk as manager of advertising and sales promotion has been announced by Twin Disc Clutch Co., Racine. Mr. Falk joined this firm in 1946 as a sales correspondent and has advanced through the ranks to this present position. He is a member of the SAE and is a commander in the U. S. Naval Reserve.

E. B. Falk

organizational news

A-C Announcements

L. D. Craggs has become construction machinery sales manager at the Memphis Branch, Tractor Group, Allis-Chalmers Mfg. Co. Before this he was assistant construction machinery sales manager at Memphis.

Reflecting departmental growth, A-C has made these heat transfer and water conditioning department appointments: C. W. Bloedorn, assistant manager; S. M. Austin, sales manager, heat transfer products and T. J. Hodan, sales manager, water conditioning products.

Mr. Bloedorn started with A-C in 1934. He is an ASME member. Mr. Austin joined the company in 1937 and had been engineer-in-charge of condenser sales since 1951. Mr. Hodan has been with Allis-Chalmers since 1942, having served as manager of the water conditioning section since 1948.

Mack Opens New Sales-Service Center

Heavy-duty truck sales and service center has been opened by Mack Trucks in Albuquerque, N. M.

Departing from the usual "T" or rectangular design common for such depots, the new structure is in the form of a "Y". This gives maximum parking space and fewer steps between departments.

H. E. Leonard, vice president of this Leonard-Mack distributorship, said the new building will stock a complete line of parts to serve all of New Mexico—with room to grow with the expanding market in that state.

In Commemoration

Albert A. Ohmer, manager of forging sales at Erie Forge & Steel Corp., died after a short illness on May 23. Mr. Ohmer was widely known in the steel industry having, served Erie Forge in various capacities for 40 years.

Penn Promotes Parts Man

Albert R. Brandish has moved up to Caterpillar parts representative in Connecticut for H. O. Penn Machinery Co. He joined the organization in 1948 as a parts clerk. Mr. Brandish will help set up a parts stockroom for customers, with simplified inventory control; suggest labor-saving special tools and promote the parts exchange program. He will also schedule rebuilding jobs to fit in with contractors' work plans.

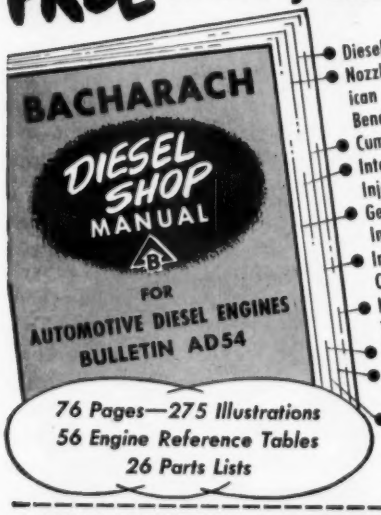
Two Detroit Diesel Changes

Appointments of Donald E. Schwendemann as manager of organization and business and Chester B. Clum, Chicago regional manager were announced by Detroit Diesel Engine Div., GM.

Mr. Schwendemann, who steps up from Chicago regional manager, will now be responsible for distributor organization programs and policies.

Mr. Clum, a graduate of General Motors Institute, first joined Detroit Diesel in 1943.

FREE to Every Shop Operator



- Diesel Compression Testers
- Nozzle Testers for American Bosch, Caterpillar and Bendix Nozzles
- Cummins Injector Tester
- International Harvester Injection Testers
- General Motors Injector Testers
- Injection Pump Calibrating Stands
- Nozzle-Injector Cleaning Tools and Lapping Blocks
- Engine Overhaul Stands
- Engine Removal and Parts Dollies
- GM 71 Engine Tools

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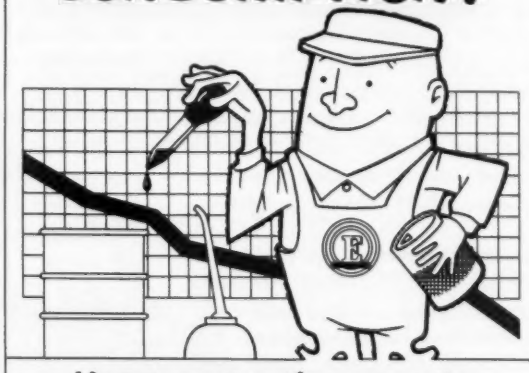
LOWEST LUBE OIL CONSUMPTION!



Keep operating costs down with

ENTERPRISE

dependable engines

ENTERPRISE ENGINE & MACHINERY CO.
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Sales and Service in Principal Cities

Quality Filtration

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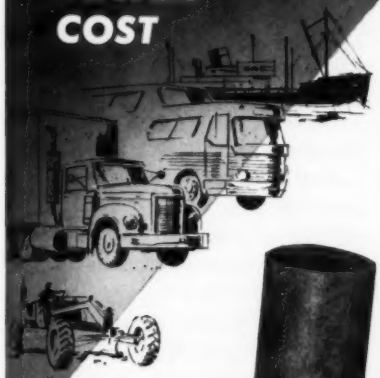
at LOWER COST



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FILTER CARTRIDGES

For Diesel Fuel Oil, Lube Oil and Air

- **LONGER LIFE** . . . exclusive Cuno "Graded Density" gives *double* the life of ordinary cartridges . . . cuts replacement costs *in half!*
- **UNIFORM FINE FILTRATION** . . . *every* Cuno cartridge eliminates *all* particles larger than rated size. Protects injectors, insures efficient engine operation at peak performance, and reduces engine maintenance.
- **FASTER, EASIER REPLACEMENT** . . . saves high labor costs involved in replacing loose-waste filter medium.

CUNO ENGINEERING CORP.
908 South Vine St., Meriden, Conn.
Filtration Engineers in Principal Cities

A COMPLETE, ENGINEERED FILTRATION SERVICE INCLUDING FILTERS FOR DIESEL FUEL, LUBE OIL, HYDRAULIC SYSTEMS AND AIR LINES

CUNO

organizational news

Snow-Nabstedt Distributor

Hathaway Machinery Co. has been appointed New England distributor for Snow-Nabstedt Gear Corp. Their territory will extend from the Connecticut-Rhode Island state line to the Canadian border. In turn, Hathaway will appoint dealers to service users throughout the area.

The plant is located on Hathaway-Braley Wharf at Fairhaven, Mass., with dockside as well as overland transportation facilities. They will stock parts and maintain service for S-N gears.

Reassignments at Cooper-Bessemer

Election of Ralph L. Boyer to vice president and director of engineering has been announced by Cooper-Bessemer Corp., Mount Vernon, Ohio. His election fills the spot left open by the retirement of Hewitt A. Gehres. Mr. Boyer has been with the firm since 1926 and will work on gas-diesel and high compression spark-ignited gas engines.

Robert F. Lay has advanced to post of vice president and assistant general manager. He will be directly responsible for coordinating the operating groups of the company. Mr. Lay first joined Cooper-Bessemer in 1924. After a period serving other firms, he returned to this company in 1946.

Grant C. Woodward is now general sales manager of the corporation. In this new capacity, he will be responsible for the sale of centrifugal and reciprocating compressors, diesel, gas and gas-diesel engines to domestic markets. He began his association with this concern as a sales trainee in 1948.

Willard A. Luli has been promoted to works manager of the Grove City plant. Hugh K. Stevenson is assigned assistant works manager.

Both R. F. Kymer and M. J. Helmich have been named assistant chief engineers. William F. Hartwick is succeeding Bruno Thiel, retired after 46 years service, as supervisor of gas compression engineering.

(*Continued on Page 76*)

Pistons after half-way immersion in Oakite Saturol. Notice how this powerful solvent cleaner reaches into grooves.

Dissolve carbon, grease, gum . . . in minutes . . . with new Oakite SATUROL

This brand new solvent cleaner is just about perfect for cleaning pistons, valves, filters, gears and other small diesel parts. A brief immersion in Oakite Saturol melts off everything—carbon, grease, paint, gasket compound . . . leaving the metal clean and bare.

Parts to be cleaned are immersed in the solvent for ten minutes to half an hour depending on condition, then rinsed off with kerosene or water . . . and that's all there is to it. Oakite Saturol has a floating vapor seal that assures long life and economy. High flash point and safety on all metals are extra advantages.

Besides large and small drums, Oakite Saturol comes in a special 6-gallon trial pail, complete with immersion basket. Ask your local Oakite Technical Service Representative to demonstrate, or write for more details to Oakite Products, Inc., 22C Rector Street, New York 6, N. Y.

OAKITE

Export Division
Cable Address: Oakite

Technical Service Representatives in Principal Cities of U. S. and Canada

new literature

New Marine Engine

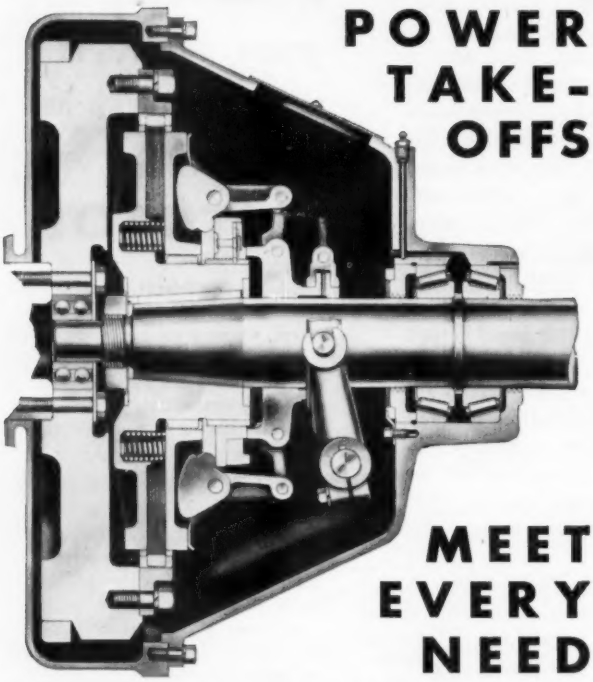
General Motors Diesel Ltd. has released a leaflet describing its recently developed Series 71 "E" marine workboat engine. It explains how this unit will give more profit for commercial marine operations. Rated at 170 hp, the maker claims a 10% savings in fuel. Five features of the new engine are illustrated.

Automatic Controls and Valves

Two catalogs have just been released by Detroit Controls Corp. No. 100-F describes automatic controls and solenoid valves for engine protection and industrial applications. No. 800 gives complete information on D. T. Williams industrial valves for steam, water, air, oil or gas applications.

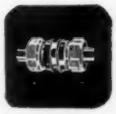
ROCKFORD

POWER TAKE-OFFS



Small Spring Loaded

Heavy Duty Spring Loaded



Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

Speed Reducers

MEET EVERY NEED

SELF CONTAINED UNIT
WIDE RANGE OF SIZES *
CONSERVATIVE RATING
ROLLER BEARINGS
FINE ADJUSTMENT
ACCURATE BALANCE
S.A.E. DIMENSIONS

* ROCKFORD POWER TAKE-OFFS are available in standard sizes ranging from 125 foot pounds to 2100 foot pounds torque. Clutch sizes range from 6½ to 18 in. double plate. These complete, self-contained units are suitable for heavy-duty gear-tooth application to current industrial gasoline and diesel engines.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

BW

ROCKFORD Clutch Division BORG-WARNER

1301 Eighteenth Ave., Rockford, Ill., U.S.A.

Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

CLUTCHES

Air and Water Hose Fittings

Service Mfg. & Supply Co. details its non-porous brass barbed hose fittings in a new data sheet. Passages are machined to maximum size for greater flow of air or water.

Elbows and shapes are formed by silver soldering bar stock components. This method permits fabrication of various combinations of hose stem outlets to pipe sizes. Off-standard shapes, sizes and lengths of elbows are made to specifications.

Short-run orders are a specialty of this manufacturer.

Standard Metallizing Symbols

Vital to marking prints of fabricated items is the use of standard metallizing symbols. Such a reference is available in a publication by American Welding Society.

Full details are given for developing metallizing symbols to specify all of the operations—surface preparation, extent of metallizing, thickness of coating and method of finishing. Typical examples are included to illustrate use of the complete symbols.

With the shortage of technical personnel, time savers such as this book are more important than ever.

Electrical Encyclopedia

More than 100 engineers, scientists and other authorities, under the editorship of Archer E. Knowlton, have contributed to the ninth edition of "Standard Handbook for Electrical Engineers." This giant reference, 2311 pages, published by McGraw-Hill, is the first revision in eight years.

It incorporates important data from all the many changes and developments which have taken place in materials, methods and applications.

It is an encyclopedia of facts, figures, definitions, conversion factors, physical and mathematical principles, accepted formulas, experimental data, etc. presented in compact, easy-to-use form.

Among subjects covered are Communication, Transportation, Electric Heating and Welding, Mine Hoists, Lightning Protection and Power Plants.

new literature

Noise Reduction

The case of industrial noise—its effect and recommended cures—is presented in a pamphlet by Sigma Engineering Co. Titled "Why Must This Be?", it evaluates a new approach to alleviating the hearing loss problem. Cartoons enliven the facts set forth.

Gear-Driven Positioners

Aronson Machine Co. in bulletin HD57 describes its gear-driven positioners for convenient positioning of heavy components, for welding or mechanical repair. Specifications and optional extras for eight different models, ranging from 500- to 24,000-lb capacity, are given.

Hazard Finder

An interesting questionnaire has been prepared by Crouse-Hinds on locating hidden hazards of electrically ignited explosions.

The check list is of value when the possibility exists of flammable gases, vapors, dusts, liquids and other combustible materials making your plant unsafe. Part of the folder is sealed until all the questions have been answered. After the seal is broken, an evaluation of the hazard potential is revealed, based on your answers and the findings of the National Fire Protection Association.

For your copy of this unique safety quiz, fill in the reply card in the back of this book.

GM "71" New Tune-Up Procedures

A new tune-up procedure for the Series 71 engine equipped with a four-valve cylinder head, limiting-speed governor, and fuel modulating device is now available. The new procedure 7SE180, is in booklet form and supersedes all other published data covering this type of engine.

Available also are two new tune-up procedures for adjusting the hydraulic output-shaft governor on Series 110 Roots blower engines. Form 7SE183 covers the adjustment for units equipped with engine-mounted air cleaners, and Form 7SE184 is applicable to units with remote-mounted air cleaners.

Hose Clamps For Industrial Applications

Ideal Corp. is now making standard and special design clamps for the original equipment market. Its complete line, described in a new bulletin, are also availabble for maintenance and replacement through industrial distributors. Specifications are included for worm drive, swivel action and adjustable strap type clamps.

Diesel Locomotive Batteries

Nicad twin cell batteries for diesel locomotive starting are detailed in a bulletin by Nickel Cadmium Battery Corp.

Less servicing, longer life, dependable high cranking currents, no noxious fumes and no corrosion of compartments are benefits claimed.

Layout diagrams, battery discharge characteristics charts and specifications are included in the data.

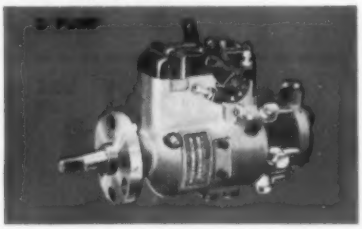
Not a penny for service in 5000 hours on my . . .

ROOSA MASTER

"I bought my Oliver tractor in 1954 and haven't had any engine or pump trouble after approximately 5000 hours of operation. I haven't spent a nickel on the Roosa Master Injection Equipment or engine for repairs. My Machine is used for back-filling, loading trucks, stripping and general excavation. My operator likes this machine very much.

"I own one more Roosa Master equipped Oliver front end loader which has operated for approximately 1000 hours with no trouble."

This praise from Contractor, Louis Recine of Newton, Mass., is just another example of what satisfied users are saying about the ROOSA MASTER Fuel Injection Pump, the lighter, smaller, more economical and dependable pump that makes good diesels better. For more complete information contact your engine manufacturer or write . . .



HMS ROOSA MASTER

HARTFORD MACHINE SCREW COMPANY
DIVISION OF STANDARD SCREW COMPANY
HARTFORD 2, CONNECTICUT

new literature

Brass Tube Fittings

Just issued by Weatherhead Co. is a 48-page catalog on brass tube fittings. Listed are all sizes and types which they manufacture.

A section is devoted to drain and shut-off cocks. Also covered are push-pull controls, complete assembly instructions on brass fittings, data on right and wrong ways for tubing a system, tube fitting data and tools.

Ready Reference on Machinery And Abrasive Finishing

Gray Iron Founders' Society has published a 57-page manual on Machining and Grinding of Gray and Nodular (Ductile) Cast Irons. The book is authored by Norman Zlatin, partner, Metcut Research Associates and Charles F. Walton, Technical Director, Gray Iron Founders' Society. It is a down-to-earth reference for use in design, engineering and production of cast components.

Part I, "Machining", includes chapters on selection of tool materials, grinding cutting tools, machining applications, machining properties of iron castings, economics of machining and general machinery recommendations. Part II, "Abrasive Finishing" covers types of finish grinding, honing and lapping.

Numerous illustrations show commercial and practical examples. The manual presents recommended practice for feeds and speeds as well as tooling. Machinability data are given for various types of iron and related to microstructure.

Battery Charging Circuit Film

For shop mechanics, students and others, there's a new sound, color film on "Regulation and the Charging Circuit". Prepared by Delco-Remy, simplified illustrations show internal construction and operation of a battery, generator and regulator. In non-technical terms, it explains how these units team up as the charging circuit.

Accompanying the 12-in film is a 16-page booklet, also in color, for further review. A guide is included suggesting procedures for showing this training film.

How to Select a Power Plant

D. W. Onan & Sons, Inc. has revised its "Blue Book" of information on selection of engine-driven electric generating plants. The pocket-sized booklet traces the history of electric plant development from the days when storage batteries were necessary to today's single-unit, engine-generator power plants.

Couched in simple language, three general groups are described: AC, DC and Battery Charging. Plant operation for each type is discussed. It reviews three types of prime mover which furnish the mechanical power for driving the generator: diesel, gas and gasoline engine.

Cost of operation and installation are included. Differences of engine cooling and starting methods are described.

A summary underlines the important points to remember in selecting an electric generating plant.

YOUR SHOP CAN POSITIVELY

GUARANTEE HORSEPOWER

with Clayton's Engine Dynamometer!

Here's the practical, universal Engine Test Machine! Guaranteed h.p. means profit. Guaranteed h.p. helps your operation—indeed, *it's the profit insurance you need!* Clayton offers you many advantages. Clayton universal mounting adapters speed diesel and gasoline engine test procedures. Engines up to 1200 h.p. set up in minutes. Alignment is automatic. The Clayton Engine Test Stand, with these adapters and the Clayton cooling system—combined with a Clayton Series 17 Engine Dynamometer—gives any engine rebuilding establishment a speedy, practical test facility.

Clayton

ENGINE DYNAMOMETER . . . complete with
ENGINE TEST STAND equipped with
UNIVERSAL MOUNTING ADAPTERS and
UNIVERSAL ENGINE COOLING SYSTEM

Write Now! LET CLAYTON'S PLAN SHOW YOU THE WAY TO ABSOLUTE PROFITS!

For specific information on how the Clayton Engine Test package can be applied to increase the profits of your particular operation, mail this coupon or write us on your business stationery. Be sure to name the engines you service.

NAME TYPE OF ENGINE SERVICED_____
NAME_____
FIRM_____
ADDRESS_____
CITY_____ ZONE____ STATE_____

SEND TO CLAYTON MANUFACTURING CO., BOX 550, EL MONTE, CALIFORNIA

new literature

Industrial Hose Selection

New 40-page hose, hose ends and assemblies catalog has been issued by Weatherhead Company, Fort Wayne Div. It incorporates detailed data on bulk industrial hose, permanently attached hose assemblies, swaged hose assemblies and ends, hose and swivel adapters. Assembly and installation instructions are included.

At-a-glance charts point out hose selection, specifications and hose end identification. For instance, over 180 elements are shown on the selector chart.

Metal Hardness Tester

Newage Industries, Inc. has issued a folder presenting the features of their 30-oz instrument for testing the hardness of any size, shape or type metal.

This tester, Newage mentions, eliminates need for calculations or conversions. The operator simply places the unit on the metal, presses the handles toward the material and reads the dial to get an accurate answer in seconds in Rockwell or Brinell ranges. Accuracy of plus or minus 1.5 on the Rockwell dial and plus or minus 5 points on the Brinell dial is claimed.

Completely portable, the instrument eliminates need for clamps, jaws or base plates and it is not necessary to cut samples or damage the work.

Wet Blast Applications

"Wet Blast Cleaning and Finishing News", a periodical by Wheelabrator Corp., discusses many applications of wet blasting in both metal cleaning and finishing operations.

Models of the Liquamatte wet blast machine are adaptable for either single piece or batch cleaning and finishing. Although the most commonly used wet blast abrasive is a silica-type slurry, other abrasives are available for special applications. described in this illustrated magazine.

Advantages of Liquamatte wet blasting are enumerated for preparation of metal parts for plating, finishing reconditioning, inspection, tool and die conditioning and mold and die cleaning.

Locomotive Maintenance

General Electric in bulletin GEA-6534 outlines nine reasons why its parts service can reduce railroad maintenance costs and increase operating efficiency. A map shows five regional railroad parts centers.

History of Diesels

"Production Road" is an interesting periodical put out by Twin Disc Clutch Co. Featured in the latest issue is the story of the birth of high-speed, high-output diesels three decades ago down to today's most modern equipment.

Shell and Tube Heat Exchangers

Condenser Service & Engineering Co. has just revised its 16-page catalog on heat exchanger equipment for industrial and power plant applications. Designs are illustrated with service recommendations given. A section covers thermal standards and reference data.

For your copy of any of this data, use the postage-free card in the last section of this publication.

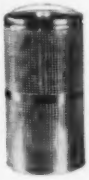
SERVICE
+PLUS
Quincy
COMPRESSORS
SERVICE
You can count on efficient, expert service for your Quincy Compressors from any of the more than one hundred Quincy Authorized Service Depots across the country. Adequate stocks of genuine factory parts are maintained for every model in the Quincy line. And because Quincy service people realize the importance of air power on your job, you can be sure of service-plus when you need it, where you want it. Depend on Quincy Compressors and Quincy service for all your needs from 1 to 90 CFM. Write Dept. J-56 for catalog today.
Quincy
COMPRESSORS
FOR LOW COST AIR POWER
QUINCY COMPRESSOR CO., QUINCY, ILLINOIS

THERE'S NO SUBSTITUTE
for LUBER-FINER'S
ENGINEERED
PROTECTION

YES! IT'S WHAT'S
INSIDE
THAT COUNTS
The Efficiency of Luber-finer's Exclusive Patented Process
HAS NEVER BEEN EQUALLED!

USE ONLY GENUINE
Luber-finer
DIESELPAKS

Only a Luber-finer Unit *Plus* a Genuine Luber-finer Pack can give the Exclusive Patented Filtering Process that has made Luber-finer The Standard of The Industry Since 1936!!



THERE'S A LUBER-FINER MODEL FOR EVERY TYPE OF ENGINE—EVERY TYPE OF OIL!!

LUBER-FINER PACKS AVAILABLE

1. REFINING PACK
Introduced to the public in 1935 for use with straight mineral oils, fuel oils, hydraulic oils, and inhibited industrial oils.

2. DIESELPAK
First made available in 1941, the DIESELPAK was primarily designed for use with H.D. detergent compounded oils and has also achieved outstanding results when used with fuel oils and straight mineral oils.

DON'T BE MISLED BY PRICE ALONE!

There is no substitute for DIESELPAK'S Patented Filtering Process for H.D. Compounded oils AT ANY PRICE!
The DIESELPAK cleans more oil faster—keeps it CLEAN longer—and gives more service and better engineered protection than ANY of the substitute filtering elements being offered for Luber-finer units.

IT PAYS TO GET THE BEST!

STANDARD OF THE INDUSTRY SINCE 1936

Luber-finer Units are Standard and Optional Equipment on America's Leading Diesel Trucks, Tractors, Stationary Engines.
Write for Complete Information to Dept. 4

LUBER-FINER, INC.
2514 S. Grand Ave., Los Angeles 7

Pump Timing Pointers

(*Continued from Page* 50)

pump is correctly timed according to the flywheel marks but still appears out of time with the engine.

Here are some good points when timing the pump to the engine:

1. Be sure cylinder you're timing is on compression and both valves are closed on 4-cycle engines.

2. Take out back lash by always turning engine in the proper direction of rotation.

3. Be sure pump is in proper timing position.

S. W. Jackson
(Nashville, Tenn.)

Diagnosing Troubles

injector; faulty cooling; high water temperature; overload; wrong fuels; improper engine speed; etc. These should be checked first.

Even if you suspect pin bushing and conrod bearing wear, don't take them apart. Lift the piston with a lever to check for excessive pin clearance. Use similar method to check conrod bearings. But remember that knocking in 2-cycle engines can't be eliminated by correcting piston pin and conrod bearing clearances. There is downward pressure on the piston whether it's going up or down. On a 4-cycle engine however, even a small increase in pin or conrod clearance may result in knocking.

Therefore at the first sound of metallic knocking in a 4-cycle engine, these clearances should be checked. If they are close to or over the maximum permitted by the manufacturer they must be corrected. This goes for all clearances whether they're for conrods, main bearings, piston rings, valves, etc.

This is typical of how all signs of trouble should be handled. Think first and when you're sure then act—but do it right the first time.

Arturo Camacho
(Cebu City, Philippines)

news of our industry

(*Continued from Page* 55)

All Aboard For LMOA Conference

All roads lead RR maintenance men to Chicago. That's the place set for the annual LMOA meeting at Hotel Sherman, September 16-18.

Among subjects to be explored are all phases of diesel maintenance, rebuilding, material reclamation, cooling and filtering systems, and fuel and lube oil. Added incentive to attend is review of exhibits sponsored by Allied Railway Supply Assoc.

All who can use or contribute data are urged to send in their reservations to Locomotive Maintenance Officers' Association, 1721 Parker St., North Little Rock, Arkansas.

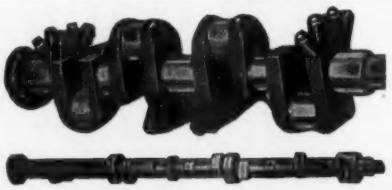
Schwitzer Overseas Agreement

Holset Engineering Co., Ltd., England, has concluded an agreement with the Schwitzer Corp., Indianapolis. This British firm will manufacture, sell and service non-bonded rubber vibration dampers and a range of turbochargers. Both Schwitzer designed product lines are available now from Holset.

Ticket to Good Merchandising

International Harvester has come up with a novel and good idea for selling used equipment. IH distributors now tag each major component of a reconditioned or rebuilt machine. This VM ticket stands for Value Measured. Each tells the "as is" or repaired value of the engine, transmission, clutch, tires or tracks, final drive and other vital areas.

The prospect just has to circle the unit and read the tags. They give him the answer to the service he can expect. That's the ticket to sound merchandising for both seller and buyer.



CRANKSHAFTS
New Process ROTOKROME Plated
CAMSHAFTS REBUILT
including railroads
Connecting Rods Rebuilt
Rotary Process Hard Chrome—Magnafluxing—Electric Heat Treating. Serving National, Diesel Equipped, Railroads, Bus and Truck Companies. *Write for prices.*

CLEVELAND HONE & MFG. CO. 8816 Harkness Rd, CLEVELAND 6, OHIO

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WITH GMC
RECONDITIONED INJECTORS

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DIESEL SERVICE CO.
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USE BELL
INJECTOR CUPS and TIPS
STANDARD AND 21° FOR THE LEADING TRUCK DIESELS
Years of proven service
Volume production on automatic machines means SAVINGS
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BELL DIESEL RESEARCH
Pioneers in research and manufacture of high speed diesel injection equipment.
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TRE-COR Prevents Conditions that Cause Overheating

Use TRE-COR Scale Eradicator for quick removal of scale and corrosion. It is a safe and economical powder material.

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Water purification consultants and engineers. Inhibitors and Corrosion Control Materials.
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Affording Maintenance At Less Cost
. . . Specializing in REPLACEMENT Parts for CUMMINS ENGINES . . .

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Pacific DIESEL Parts Co.
4278 So. Hoover St., Los Angeles 37, Cal.
ADams 1-4021

news of our industry

Branch Shop Rebuilds Turbos

First factory rebuild branch for Cummins turbochargers has been set up at Fort Worth, Texas. Before this, all turbochargers were returned for rebuilding to the Cummins Engine Co. plant at Columbus, Indiana.

The branch is now equipped with highly specialized machinery and its personnel trained in factory methods of repairing and rebuilding turbochargers. Goal is to have this the turbo service center for a large part of the south and southwestern area of the U. S.

New AERA Officers

The 35th Annual Automotive Engine Rebuilders Convention presented a well-balanced program of technical data. At the close of this successful meeting these officers were elected for the coming year: President, Fred A. Lambert of Lambert Co., Ltd.; 1st vice president, Leonard Connett of Piston Ring Service Co.; 2nd vice president, Franklin C. Bradley, Jr., Connecticut Bearings Co., and Treasurer, Charles W. Yount, Eagle Machine Company.

Reproduction of the AERA convention proceedings will be made as soon as possible so members may profit from the technical information presented.

Attention—Power Plant Supers

Mighty useful tool is the Oil & Gas Engine Power Cost Report now being compiled by OGP Division, ASME. This forthcoming edition will present 1956 operating costs. The extent of its value depends on the facts and figures supplied by individual diesel power plants. The more reports received, the more significant the statistics will be.

Help OGP to help you and other operators by getting your cost report to them right away. If you don't have forms, write for them. The address is: Sub-Committee on Oil & Gas Engine Power Cost, OGP Division, ASME, 29 West 39 St., New York 18, N. Y.

The important thing is for you fellows to send in complete data quickly.

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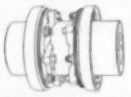
Specify
THOMAS
FLEXIBLE COUPLINGS

DOUBLE FLEXING
DBZ — for high speed, heavy duty drives

FLOATING SHAFT
BMR — for heavy duty service with excessive misalignment



DOUBLE FLEXING
AMR — for engine and medium speed drives

SINGLE FLEXING
SS — for engine-driven generator sets with out-board bearings

Thomas' 40 years of flexible coupling experience is at your disposal to help you meet ordinary applications or special variations for unusual cases.

UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES.

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
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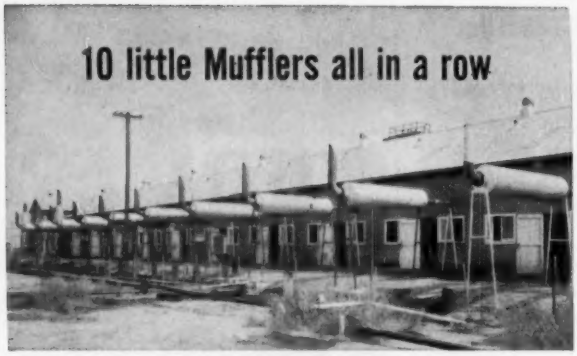
8 No Maintenance

Write for Engineering Catalog 51-A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U. S. A.



...and they're all Kittell's!

In areas where little or no exhaust noise can be tolerated, use Kittell residential-type silencers—like the ten horizontally-mounted KR's shown above. The unique features of Kittell silencers and spark arrestors are the result of more than 15 years of silencer design and fabrication experience. Models are available for almost all industrial, mobile and marine applications. Excellent delivery on both standard models and specials. When local dealers do not have the desired size in stock, shipment is made from the factory in from one to four days. Special engineering also available when required.

Kittell

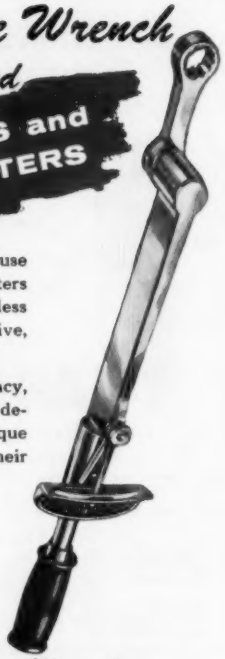
Write for new 1957 catalog just off the press.

Kittell Muffler & Engineering, Inc.

915 SOUTH SANTA FE AVENUE, LOS ANGELES 21, CALIFORNIA

Only **ONE** *Torque Wrench can be accurately used with . . .*

EXTENSIONS and ADAPTERS



It is mechanically impossible to use any Torque Wrench with adapters or extensions (with accuracy) unless that Torque Wrench has a positive, built-in, fixed load position.

This essential factor of accuracy, misunderstood or ignored in the design and manufacture of some torque tools, can completely defeat their purpose.

PATENTED PIVOTED HANDLE FIXES LOAD POSITION

Write for Torque Manual

with formulae tables and explanations for correct use of adapters and extensions.

P A Sturtevant Co.

ADDISON QUALITY ILLINOIS

new products

(*Continued from Page* 59)

Medium-Duty Bearing

Clevite Service now introduces an "intermediate duty" capacity bearing. Made of copper-lead, Clevite 55 was developed for use in engines with loads beyond the capacity of babbitt bearings but not requiring the load-carrying capacity of Clevite 77 bearings.

The new type utilizes a combination of a sintering process and strip casting techniques. First, a copper powder is sintered to the steel back to form a porous lining, into which a lead-tin alloy is cast, surrounding the copper particles and forming a copper-lead matrix. After being broached and burnished to finished size, Clevite 55 is plated with pure tin for surface protection.

According to the company, these combined methods result in an exceptionally homogeneous matrix, with fine grain and uniform dispersion of copper and lead-tin alloy.

How to Protect Storage Tanks

Perlite concrete sprayed on storage tanks forms a fireproof barrier and insulates against evaporation loss. The insulated concrete adheres readily to paper-backed wire lath attached to steel stud framework erected around tanks.

United States Gypsum Co. says this new method works. They used it on three medium-sized fuel oil tanks at their Philadelphia plant. Municipal fire regulations had prevented their enlarging a building close by a 50,000-gal fuel tank. Approval was granted, however, after applying the fireproofed concrete.

Besides the fireproof and evaporation loss protection, the Perlite concrete protects metal tanks from rust and weather. The coating, of course, is rot and vermin proof. All these features add up to lower tank maintenance costs.

For more details on this Perlite safety technique for fuel tanks, check the reply card in the last section of DIESEL POWER.

High Flow Rate Filter With Lower Pressure Drops

After three years reesarch at Hillard Corp. laboratories, they have developed a new filter cartridge. Termed type PL, this filter cartridge permits higher flow rates with lower pressure drops than previously obtained. It is suitable for oil, water and many other liquids.

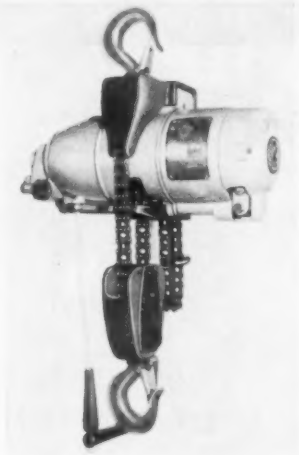
It consists of a fine quality pleated filter paper, impregnated with a heat stabilizing resin cured at the stabilizing temperature. This extended surface-type filter is then formed around a metal center tube. End plates and a protective shield are attached by a special Hilco process.

The PL cartridge is recommended for full flow filter applications. It will filter out particles down to 5 microns with continuous recirculation resulting in even finer filtration. Hilco mentions the added advantage of higher flow rate with lower pressure drop results in obtaining smaller casings than those offered for lower flow rated filter cartridges.

Two-Ton Capacity Air-Powered Hoist

A new 4000-lb capacity hoist has been added to the line of air-powered units made by Gardner-Denver Co., Keller Tool Div.

Fitted with either roller or link chain, lifting and lowering speed varies from a creep to 10 ft per min at full load and 90 psi air line pressure. Length of lift is 8 ft and the hoist operates by one-hand control bar or remote pendent control.



Gardner-Denver states the axial-piston compressed air motor assures positive starts and stops, prevents motor burnouts during stalls. A centrifugally governed, fully mechanical brake prevents slippage.

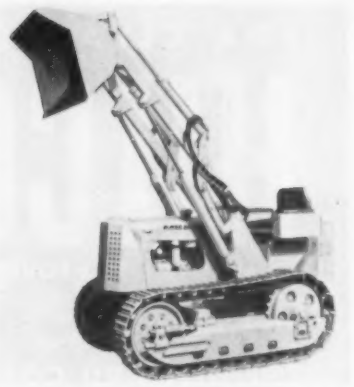
The unit weighs 100 lb and is equipped with swivel-mounted safety suspension and load hooks.

Micro-Scriber

Griest Mfg. Co. introduces a Slim-Line micro-scriber for fine detail work. It's a useful gadget for die layout and marking in tool rooms, repair and maintenance shops and industrial plants.

The Slim-Line can be used for close, fine scribing on most any surface, including case-hardened steel, bronze, brass, copper, Monel, titanium and aluminum.

Shaped like a hexagonal pencil, its tip is made of 95% tungsten carbide and 5% cobalt, diamond ground and precision lapped. It is secured within the anodized aluminum body of the scriber.



Ground-Hugging Loader

New Oliver OC-46 high-speed loader features a low silhouette. This design reduces pedestal height giving wider vision and more loader stability.

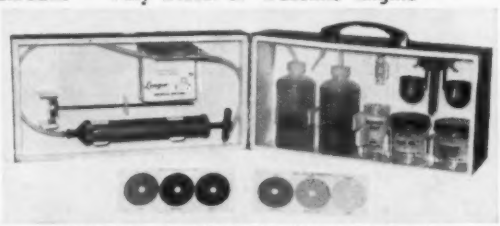
Built as a tractor-loader in one compact unit with simplified trencher mounting, this work package has 22-hp engine with 4-speed transmission. It has a 5/8-yd bucket with increased roll-back and dump angle.

Easy operation and fast-acting hydraulic loader controls give production advantages.

NEW!

THE OIL TESTING KIT DEVELOPED FOR THE U.S. GOVERNMENT IS NOW AVAILABLE TO YOU

For Trucks, Busses, Tugboats, Power Plants, Ships, Railroads — Any Diesel or Gasoline Engine



SIMPLEX OIL TESTING KIT (Pat. Pend.)

NOW You Too Can
- QUICKLY (5 minutes)
- ACCURATELY (Equals A.S.T.M.) Results
- INEXPENSIVELY (3c per sample)
- SIMPLY (No Technical Training)

CHECK YOUR USED ENGINE OILS
For The Presence of These Damaging Contaminants:
- CORROSIVE ACIDS
- FUEL DILUTION
- SOLID CONTAMINANTS
- WATER

Learn how it can fit into your preventive maintenance program

ASK FOR DETAILS

Lengor TOWNSWORTH BLDG.—ANNAPOLIS, MD.

SPEED SENSITIVE SWITCHES
1, 2 and 3 ELEMENT

UNDERSPEED . . . One S.P.D.T. switch to trip at speeds as low as 400 RPM. Maximum operating speed 5,000 RPM.

OVERSPEED . . . One S.P.D.T. switch to trip at speeds between 500 and 6,000 RPM.

OVER AND UNDERSPEED . . . Two S.P.D.T. switches to trip at two different speeds between 500 and 6,000 RPM.

OVER—INTERMEDIATE AND UNDERSPEED . . . Three S.P.D.T. switches to trip at three different speeds between 1,200 and 6,000 RPM.

Speeds above or below those listed above must be referred to our Engineering Department for special consideration. Request Bulletin 504 describing our Speed Sensitive Switches.

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8151 N. RIDGEWAY AVE., SKOKIE, ILLINOIS
Automatic Engine Control Sets • Special Control Panels • Safety Alarm Sets • D.C. Solenoids • Heavy Duty Relays

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THE HILLIARD CORPORATION, 120 W. FOURTH ST., ELMIRA, N. Y.

Service Section

Fuels For IH Diesels

(*Continued from Page 51*)

2 furnace oils that are suitable for diesel engine use. Since engine operation alone can demonstrate the suitability of these fuels, their performance in IH engines is definitely the responsibility of the supplier.

As there is no clear-cut division between the specification of the heaviest No. 1-D and lightest No. 2-D diesel fuels, there has been a tendency for some suppliers to double brand their fuels and market the same grade for both No. 1-D and No. 2-D requirements. The following specifications will serve as a guide to define the limits of the important physical properties of No. 2 or No. 2-D fuels for most satisfactory performance in IH diesel engines.

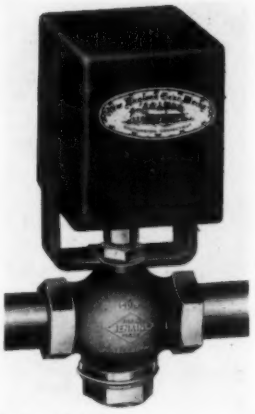
Gravity	30 A.P.I. Min.
Flash point	125°F. Min. or Legal
Pour point	10°F. lower than minimum anticipated temperature
Cloud point	preferably not more than 10°F. higher than pour point
Water and sed. (by vol.)	0.10% max.
Carbon residue (on 10% residuum)	0.25% max.
Ash (by wt.)	0.02% max.
Distillation:	
Initial boiling point	325°F min.
50% boiling point	475°F min.
90% boiling point	546°F min.
90% boiling point	675°F max.
End boiling point	725°F max.
Sulphur (by wt.)	0.4% max.
Cetane No. (ign. quality)	40 min.
Copper strip corrosion 3 hrs. at 212°F.	No. 3 max.
Color	3 N.P.A. max.
Viscosity, kinematic @ 100°F, centistokes—min.	1.8
Viscosity, kinematic @ 100°F, centistokes—max.	5.8

When sub-zero weather is encountered, fuels with low cloud and pour point are required. Under these conditions the No. 1-D fuels may be found necessary and can be used. Kerosene-type fuels are not recommended except where extremely low cloud and pour points are required.

Some fuels meet the above specifications. But because of their composition they will not give satisfactory wear performance or freedom from deposit-forming characteristics without use of high-additive, heavy-duty lube oils. These include high-sulphur content fuels.

Complete knowledge of the performance characteristics on IH diesel engines, of the fuels marketed in your area, and the types of crankcase oils required to give satisfactory performance with them, will avoid service problems.

new products



Motorized Valve

New England Gear Works introduces a motor-operated globe valve with only eight moving parts. It is designed especially for heavy-duty industrial and heating applications.

Features include automatic disc compensation, tight shut-off, permanent lubrication and no mounting restrictions.

It is available in ten sizes from ¼ in. to 3 in., with pressure capacities up to 150 lb. The valves will operate on 24, 115- and 230-v, 60-cycle ac. There are three timing cycles—eight, 32 and 139 seconds.

For more data on this automatic valve, fill in the red postal card inserted in this issue.

BARSAD

Pat. Pending

FOR DIESEL ENGINE, BOILER AND GAS TURBINE FUELS

High temperature corrosion caused by sulfur, vanadium and sodium is a major problem to operators of diesel engines, gas turbines and high pressure boilers. BARSAD will prevent this corrosion.

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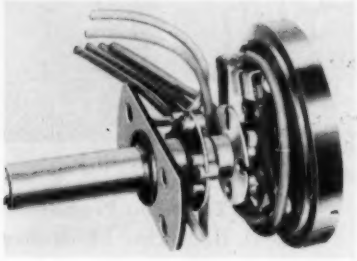
we'll be glad to bill you later



Speed Detector For Diesel Generators

New self-contained speed detecting device has been designed by Torq Engineered Products, Inc. Called the Syncro-Pak, it utilizes two Syncro-Snap centrifugal switches as the sensing elements for overspeed and underspeed.

The unit is dust tight and provides its own shaft mounted in ball bearings. The shaft can be coupled by any normal method to the shaft of the equipment to be protected or controlled.

When used on diesel generators, the versatility of this speed detector can be realized. One to four units can be employed to control various stages, such as disengaging the starting mechanism when proper speed has been reached, protecting the electrical and mechanical equipment against the dangers of overspeed, and other controlling requirements.

THE AMAZING NEW
"HI-POP"
INJECTOR
VALVE SPRING

For GM Diesel
Models "71", "110", etc.
Delivers over 950 pounds pop pressure when assembled with new parts — 25% to 33⅓% more than other springs when assembled with old parts.
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GRIND CRANKSHAFTS IN THE BLOCK!
The Winona Isthelok Crankshaft Grinder has given fast, accurate service in the Automotive field for over 18 years. Now it's available to the Diesel field. With a new large hook, the standard grinder will now grind shafts up to 3½" in diameter in the block!
WRITE FOR DESCRIPTIVE LITERATURE AND PRICES.
WINONA TOOL MFG. CO.
WINONA, MINN. U.S.A.

organizational news

(*Continued from Page 63*)

Appointments at De Laval Steam Turbine

Changes to meet the needs of inincreased sales activities of the standard products department of De Laval Steam Turbine Co. were announced by H. G. Bauer, vice president and general sales manager.

W. J. Mongon is now manager of marine standard products department. J. E. Gutzwiler is assistant chief engineer with responsibilities over worm gear and Imo pump engineering. Both will report to M. B. Sennet, manager of the department.

Con Diesel Buys Lima Electric

Consolidated Diesel Electric Corp. has acquired Lima Electric Co., manufacturer of gearshift drives and electric motors. Norman I. Schafler, Con Diesel president, reports the purchase represents the latest step in a program of diversification within the fields of diesel, electric generating and other equipment.

Wayne M. Gideon has been appointed vice president and general manager of this new Con Diesel subsidiary.

Patrick F. Dwyer and Burt F. Wyandt will continue in the posts, respectively, of sales manager and chief engineer.

FUEL INJECTION EQUIPMENT DIVISION
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Canadian Distributors:
Joseph Lucas (Canada) Ltd., Head Office: 11 Davies Avenue, Toronto 8, Ontario
Branch Office: 3401 St. Antoine Street, Montreal 30, Que.

AP174-830

D. H. Mitchell

Le Tourneau Promotions

D. H. Mitchell has assumed the post of eastern sales manager for Le Tourneau-Westinghouse Company. In this assignment Mr. Mitchell will have charge of the sales operations in 21 states and 4 Canadian provinces. He replaces James A. Vincent who now heads Adams Construction Equipment Co., Florida distributor for LeT-Wes Co.

Another promotion is that of O. C. Zachary to district sales representative for Le Tourneau in Virginia and the Carolinas.

Retires from Link-Belt

G. H. Olson, who rose from clerk to a director of Link-Belt Speeder Corp., Cedar Rapids, retired after 47 years of service.

He is one of the most widely known individuals in the power crane and shovel industry. Throughout his career, Mr. Olson has been active in most of the associations dealing with cranes and shovels.

Realignment at Fairbanks

Robert H. Morse, Jr., president of Fairbanks, Morse & Co., has announced three reassignments and five promotions.

Reassigned are: Robert H. Morse, III, now vice president in charge of budgets and planning; V. H. Peterson, vice president in charge of sales; John A. Cuneo, vice president in charge of foreign operations. Mr. Cuneo will handle the company's Canadian and Mexican operations as well as its export division.

John C. Elmburg was promoted to general sales manager. G. R. Anderson, Sr., is now chief engineer.

C. E. Clausen was named manager of the Kansas City plant. H. M. Goodchild was upped to works manager and G. R. Anderson, Jr., was made chief engineer at the Vermont plant.

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EXCELLO, G-M, MURPHY, I-H
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ADVERTISERS' INDEX

AiResearch Industrial Div., Garrett Corp., The 26
Air Maze Corp., The ***
Albertson & Co. 9
Allis-Chalmers Mfg. Co. ***
Aluminum Co. of America ***
American Air Filter Co. ***
American Bosch Div., American Bosch Arma Corp. ***
American M.A.R.C. 60
Amot Controls Corp. 58

Bacharach Industrial Instrument Co., Inc. 62
Beard & Stone 77
Bell Diesel Research 69
Bendix Aviation Corp., Eclipse Div. ***
Bendix Aviation Corp., Scintilla Div. ***
Borg-Warner Corp., Rockford Clutch Div. 64
Bosch, Robert Corp. ***
Briggs Filtration Co., The 58
Brush Aboe Inc., Petter Engine Div. ***
Burgess Manning Company ***

C.A.V. Ltd. 76
Chicago Pneumatic Tool Co. ***
Cities Service Oil Co. 11
Clark Equipment Co. 3rd Cover
Clayton Mfg. Co., Dynamometers Div. 66
Cleveland Hone & Mfg. Co. 68
Clevite Service Div., Cleveland Graphite Bronze Co. 22
Commercial Filters Corp. ***
Connell Co., W. J. ***
Cook, C. Lee Co. 6
Cooper-Bessemer Corp. 18
Cuno Engineering Corp. 63

De Laval Steam Turbine Co. 21
Delco-Remy, Div., General Motors Corp. 12, 13
Detroit Controls Corporation ***
Detroit Diesel Engine Div., General Motors Corp. ***
Diesel Fuel Injection Service Co. 77
Diesel Injection Sales & Service 77
Diesel Parts Co. of California, (SACO) 75
Diesel Plant Specialties ***

Eaton Mfg. Co. 4
Electro-Motive Div., General Motors Corp. 8
Elliott Company ***
Ellwood City Forge ***
Engine Life Products Corp. ***
Enterprise Engine & Machinery Co. 62
Erie Forge & Steel Co . 3

Fairbanks, Morse & Co. ***
Florida Diesel Service Co. 77
Fram Corp. ***
Fulton-Sylphon Div., Robertshaw-Fulton Controls Co. ***

Garrett Corp., The AiResearch Industrial Div. 26
General Motors Corp., Delco-Remy Div. 12,13
General Motors Corp., Detroit Diesel Engine Div. ***
General Motors Corp., Electro-Motive Div. 8
General Motors Corp., Harrison Radiator Div. ***
Gillett & Eaton, Inc ***
Greenlee Bros. & Co. 75

Halsted Truck Parts 75
Hancock Diesel Service Co. 69
Harrison Radiator Div., General Motors Corp. ***
Hartford Machine Screw Co. 65
Hercules Motors Corp. ***
Hilliard Corporation, The 72
Hotstart, Kim, Mfg. Co. 61
Houdaille Industries Inc., Manzel Div. ***

Illinois Testing Laboratories, Inc. ***
Ingersoll-Rand Co. ***
International Harvester Co. 25
International Nickel Co. 23
Interstate Diesel Service, Inc. 77

Johnson Bronze Co. ***

Kato Engineering Co. ***
Kent-Moore Organization, Inc. ***
Kiene Diesel Accessories, Inc. 61
Kittell Muffler & Engineering Inc. 70
Koppers Co., Inc. ***

Longor, Inc. 71
Luber-Finer, Inc. 68

Magneto Ignition Co., Inc. 77
Manzel Div., Houdaille Industries, Inc. ***
Maschinenbau, Kiel, Aktiengesellschaft (MAK, Kiel, Germany) 7
M.A.N. Maschinenfabrik Augsburg-Nurnberg (A.G. Augsburg, Germany) ***
Maxim Silencer Co. ***
Mechanical Engineering Co. 77
Minneapolis Honeywell ***
Morco, Inc. ***

Napier & Sons, Ltd. 54
National Forge & Ordnance Co. ***
Nordberg Mfg. Co. ***
Norris R. S. & Associates 72
Wm. W. Nugent & Co. ***

Oakite Products, Inc. 63

Pacific Diesel Parts Co. 69
Park Drop Forge Co., The 59
Peninsular Engineering & Sales Co. 77
Perfect Circle Corp. 57
Petter Engine Div., Brush Aboe, Inc. ***
Purolator Products, Inc. 2

Quincy Compressor Co. 67

Robertshaw-Fulton Controls Co., Fulton Sylphon Div. ***
Rockford Clutch Div., Borg-Warner Corp. 64

Schwitzer Corp. ***
Scintilla Div., Bendix Aviation Corp. ***
Sealed Power Corp. 28
Shanahan, Leo M. Co. ***
Sharples Corp. 14
Shell Oil Co. 19
Snap-On Tools Corp. ***
Spray Products Corp. ***
Standard Oil Co., Inc. (California) 17
Standard Oil Co., Inc. (Indiana) Fourth Cover
P. A. Sturtevant Co., The 70
Synchro-Start Products Corp. 71

Texas Company, The 2nd Cover & 1
Thomas Flexible Coupling Co. 69
Thompson Products, Inc., Jet Div. 15
Tobin-ARP Manufacturing Co. ***
Treanor Corp. 69
Tuthill Pump Co. ***
Twin Disc Clutch Co. 24

United Engine & Machine Co. ***

Van Norman Automotive ***
Vellumoid Co. ***
Viking Instrument Co. ***
Viking Pump Co. ***

Waukesha Motor Co. ***
Westinghouse Electric Corp. 20
White Diesel Eng. Div., White Motor Co. 16
Wilkening Manufacturing Co. 10
Winona Tool Mfg. Co. 75
Wislow Engineering & Mfg. Co. ***
Woodward Governor ***
Worthington Corp. ***
Wyman-Gordon Company ***

Young Radiator Company 53

Zollner Machine Works ***

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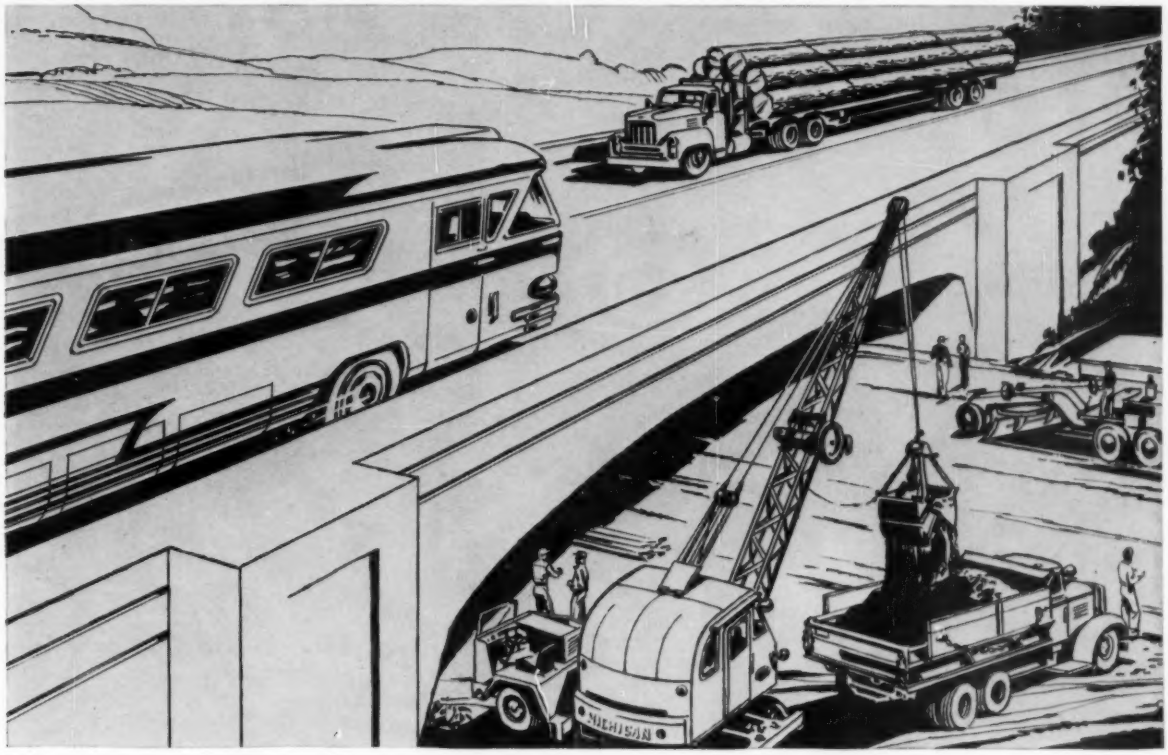

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CLARK® EQUIPMENT

Neodesha packs 1-2 performance punch

1 | *Nordberg Diesels* 2 | *STANODIESEL Oil M*

Operator J. N. Finkinbinder (left) and Everett Powell, Neodesha Superintendent of Electric and Water Plants, adjust rocker arm assembly of Nordberg Duafuel Engine. Engine operated 40,431 hours before overhaul, carrying about 90% of load. All engines in service at Neodesha are Nordberg's. All use Standard Oil's STANODIESEL Oil M.

Finkinbinder and Powell inspect oil filter used for filtering STANODIESEL Oil M used in all six Nordberg Diesels at Neodesha, Kansas, power station.

Quick facts about STANODIESEL OIL M

- Keeps crankcase, pistons, cylinder walls clean.
- Combats deposit and wear problems imposed by using economy fuels.
- Maintains film on difficult to lubricate parts.
- Eliminates spark plug fouling in spark-ignited gas engines and reduces combustion chamber ash and deposits in engines burning natural gas, LPG and liquid fuels.
- Eliminates fuel injector and pump sticking caused by deposits on injector barrel and plunger where fuel and lube oil mix.

The city of Neodesha, Kansas, has six Nordberg engines in service. They have operated more than 400,000 hours on Standard Oil diesel lubricating oils. Here is the case story of one of these engines. The performance of this engine is typical.

In 1952, the city of Neodesha installed a 1,750 hp., 1230 kw., Nordberg Duafuel engine. During the period between February 14, 1952, when the engine went into service, and March 1, 1956, the engine ran 34,370 hours out of a possible 35,784. This is 96% of the engine's total installed hours. In this time, not even a piston or cylinder head was removed. So good was the performance of this engine using STANDARD HD Oil that when Standard introduced an improved diesel oil—STANODIESEL Oil M—in February, 1955, this engine was converted to this new oil.

There is more to the story. The engine continued in service to 36,223 hours when No. 7 cylinder liner was pulled to put rubber gaskets on liner to stop water leakage. At this time, No. 7 piston and liner were checked. Liner wear averaged only 0.0045 inches. The top ring showed an average wear of 0.016 inches. The No. 2 ring was 0.020 inches. Little, if any, wear was indicated on other rings. Now, at 40,431 hours, the engine is down for overhaul of turbocharger and to have valves ground. Bearings were found in excellent condition. No pistons are to be pulled.

Get more facts about STANODIESEL Oil M by calling the Standard Oil office near you in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Illinois.

STANDARD

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(Indiana)